UNIVERSITY OF CALIFORNIA, SAN DIEGO
MARINE PHYSICAL LABORATORY OF THE
SCRIPPS INSTITUTION OF OCEANOGRAPHY
SAN DIEGO, CALIFORNIA 92152

# ELECTRONIC COMPONENTS AT 10,000 PSI

VICTOR C. ANDERSON, DANIEL K. GIBSON and ROY E. RAMEY

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# ELECTRONIC COMPONENTS AT 10,000 PSI

Victor C. Anderson, Daniel K. Gibson and Roy E. Ramey

University of California, San Diego
Marine Physical Laboratory of the
Scripps Institution of Oceanography
San Diego, California 92152

## ABSTRACT

This report presents the results of a component test program in which a series of commercial electronic components were immersed in oil and subjected to hydrostatic pressures ranging from 0 to 10,000 psig. Over 3000 components representing 163 manufacturer types were tested. Results are presented in graphic form for the readers' own interpretation.

## INTRODUCTION

Electronic equipment used in deep submergence oceanographic work has generally been protected from pressure damage by encasing susceptible components and assemblies in a heavy pressure case designed to withstand the extreme pressures.

The inconvenience and high cost of large, high pressure cases has generated interest in investigating other means of protecting underwater electronic equipment from the deep-ocean environment. Some types of electronic components are capable of operating at the deep-ocean ambient pressures. For equipment constructed with these components, the package design is reduced to one of surrounding the electrical equipment with a lightweight housing filled with an insulating fluid maintained at ambient sea pressure through a pressure equalizing diaphragm. The only requirements imposed on the fluid are that it possess good electrical insulating properties and produce no harmful effects on the components. Sealing problems associated with mechanical and electrical penetrations through the package wall into the sea, or from the sea, are virtually eliminated since little or no pressure differential exists across the barrier.

The performance of a limited number of components under high pressure was reported by Buchanan and Flato in 1961. Since that time a number of articles and reports have appeared on the topic. The bibliography lists several which may be of interest to the reader.

As part of a program involving extensive use of ambient pressure electronics, a comprehensive testing program was undertaken at the Marine Physical Laboratory in the summer of 1964. Letters were sent to leading component manufacturers inviting submission of samples for testing in the program.

More than half of those manufacturers invited responded by submitting over 3000 parts for testing. The tests of those components and their results are the subject of this report. The test data are presented in the form of graphs with accompanying descriptions and photographs of physical damage for the individual reader's interpretation. All data have been presented without any attempt on the part of the laboratory to give opinions or form conclusions.

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Progress Report #2, ER 12533, Aug. 1962.

## TEST PROGRAM

### Test Procedure

The test samples when received were catalogued and visually inspected for damage prior to being tested.

Sets of twenty components were used in each test wherever possible to obtain an adequate statistical sampling which would offer a more reasonable probability of failure or extreme deviation than a single component.

A maximum of seventy six components were installed in a pressure chamber containing a laboratory grade of light mineral oil. The chamber was sealed off and an initial set of readings taken at zero psig. The pressure was increased in 1000 psig increments to 10,000 psig and then varied between 0 and 10,000 psig for a total of five cycles. A soak period at a prescribed pressure was conducted as time and conditions allowed. Pressure was then reduced to zero psig.

Electrical measurements of the components were made at the initial zero pressure conditions, at each of the 1000 psig increments, after the cycling period, at the end of the soak period and finally on return to zero pressure, making a total of fourteen readings per component. The test conditions corresponded to the respective manufacturers' specifications.

The components were then removed from the chamber, cleaned and visually inspected for physical damage.

### Data Reduction

Data taken during the test, using instruments listed in "Description of Test Equipment," were recorded on prepared data sheets. This data was then transferred to punch cards for processing by a Control Data Corporation 3600 computer.

The computer was programmed to normalize each reading in a test sequence of a particular test component to that component's initial zero pressure reading. The results at each pressure station for a set of samples were averaged and the maximum and minimum values determined by the computer. Any component deviation of more than 50% from the initial zero pressure readings was considered an incipient failure and deleted from the computations for that pressure. In some cases the apparent failures recovered at some subsequent pressure. These cases were then returned to the program at the recovery pressure.

The average, minimum and maximum values, number of components in a set, and pressures at which failures occurred are shown on individual graphs for each set of components tested. Additional descriptions and typical photographs are supplied of all visible mechanical damage. The presentation of this data is covered under "Data Format" in this report.

## Description of Test Equipment

A schematic diagram of the test setup is given in Fig. 1. The hydraulic system is self explanatory. The chamber itself is a 192 cu. in. cylindrical pressure vessel. A screw-on, O-ring seal top contains six electrical bulkhead connectors and one hydraulic vent valve. Test samples were attached to a mounting bracket on the removable chamber top. The various electrical testing configurations are shown schematically in Fig. 2. The major testing components are listed below.

## Test Equipment List

| Description | | Manufacturer |
|---|---|---|
| Pressure Chamber | | Marine Physical Laboratory |
| Pressure Gauge, 0-10,000 psig | Model No. 8338 | Ashcroft |
| Pressure Regulator | Model No. 8804 | Bastian-Blessing Co. |
| Air-to-Hydraulic Booster Pump | Model No. 15067WT | Scientific Engineering Corporation |
| System Oiler | Model No. 8844 | Bastian-Blessing Co. |
| Stepping Relay | Model No. 20-1004 | C. P. Clare |
| Isolation Trans. | Model No. 1F921 | Chicago-Stancor |
| Constant Voltage Trans. | Model No. 20808 | Sola Corporation |
| Volt-Ohmeter | Model No. 412A | Hewlett Packard |
| AC Voltmeter | Model No. 400D | Hewlett Packard |
| Impedance Bridge | Model No. 250DA | Electro Scientific Corporation |
| Wide Range Oscillator | Model No. 200CD | Hewlett Packard |
| Oscilloscope | Model No. 535 | Tektronix, Inc. |
| Transistor Curve Tracer | Model No. 575 | Tektronix, Inc. |
| Binocular Microscope | Model No. SVB-73 | Bausch & Lomb |

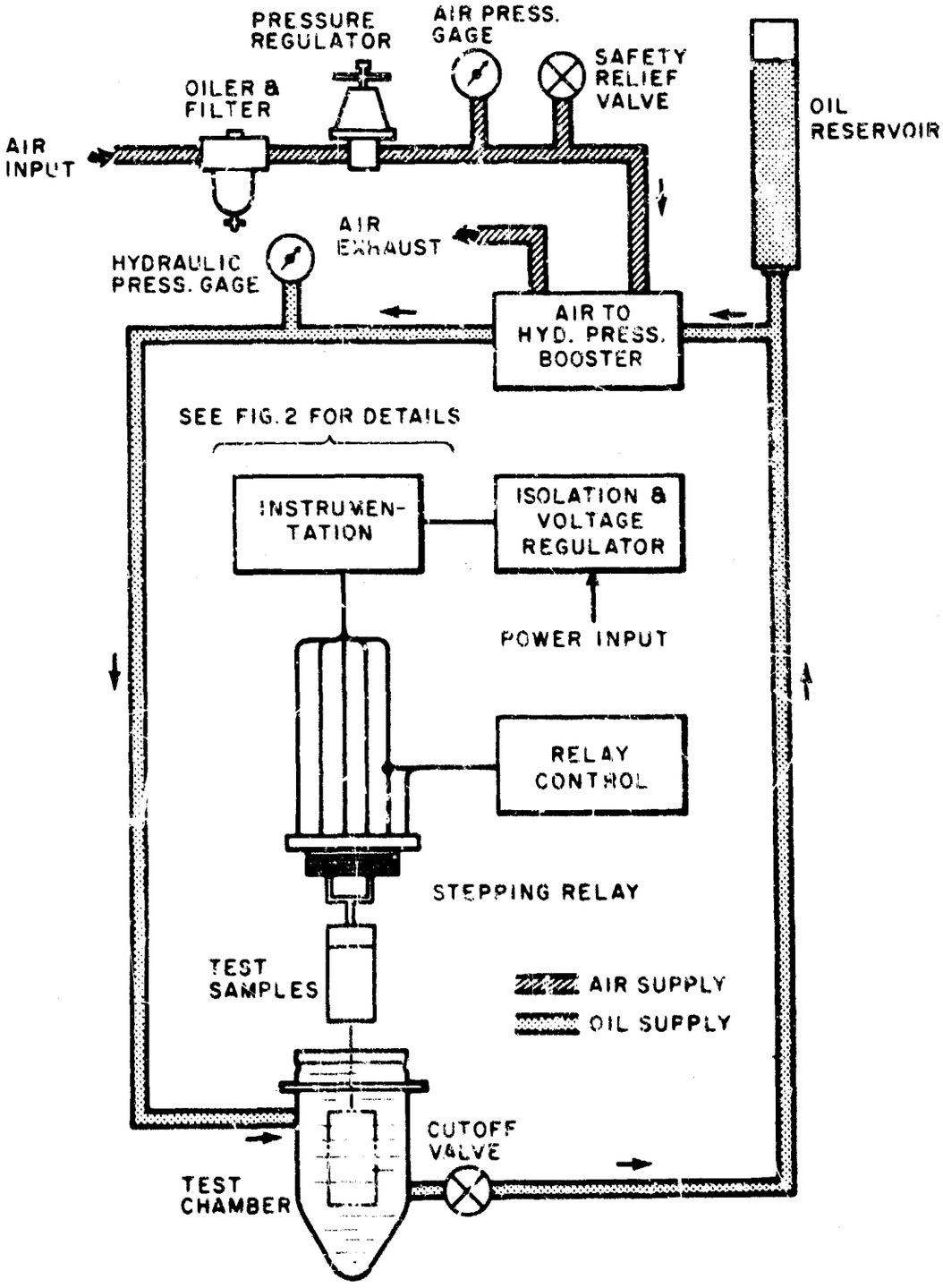



Fig. 1. Test Setup

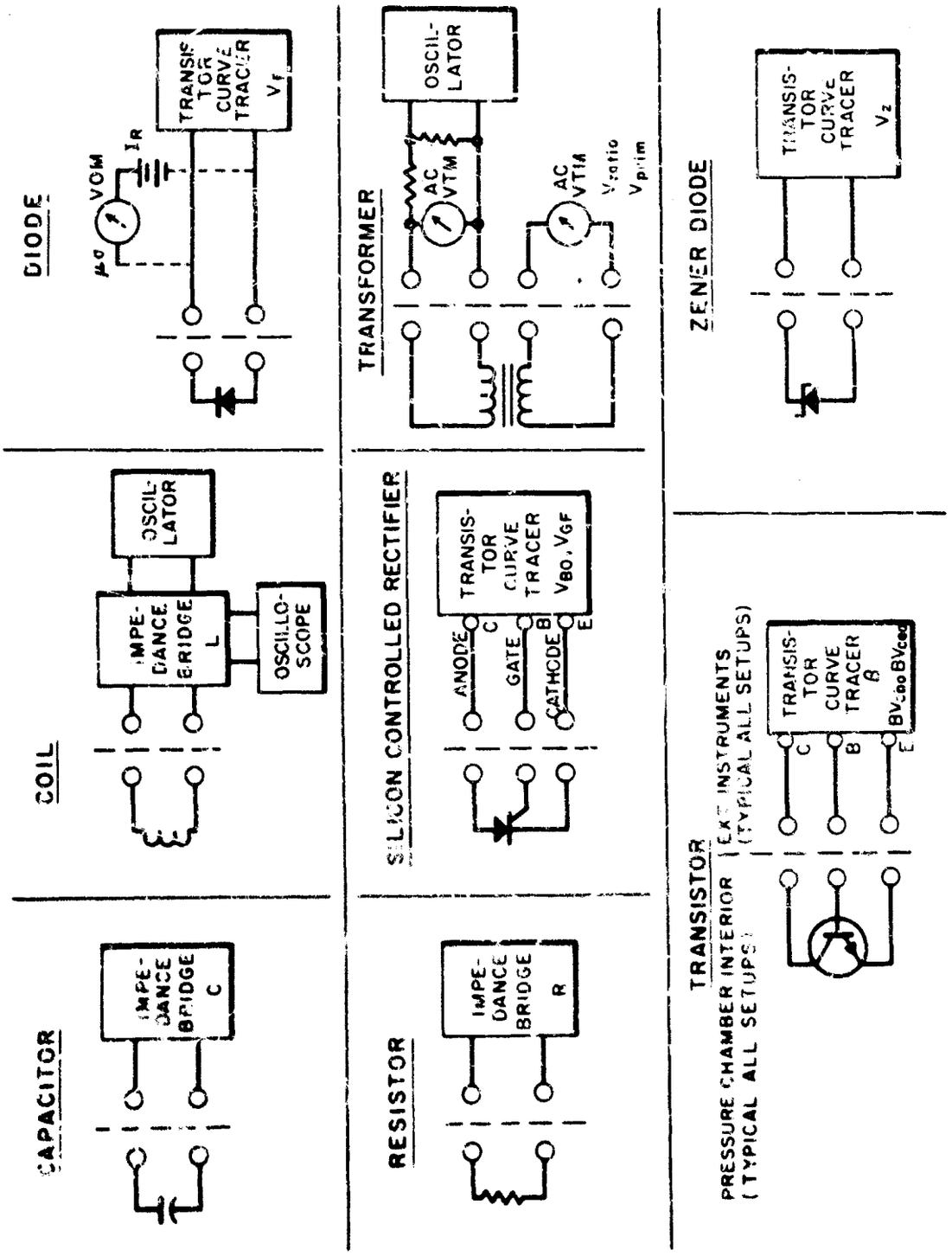



Fig. 2. Electrical Testing Configurations

## TEST DATA

### Index of Components by Manufacturer

## Index of Components by Manufacturer (Cont'd)



## Index of Components by Type

## Data Format

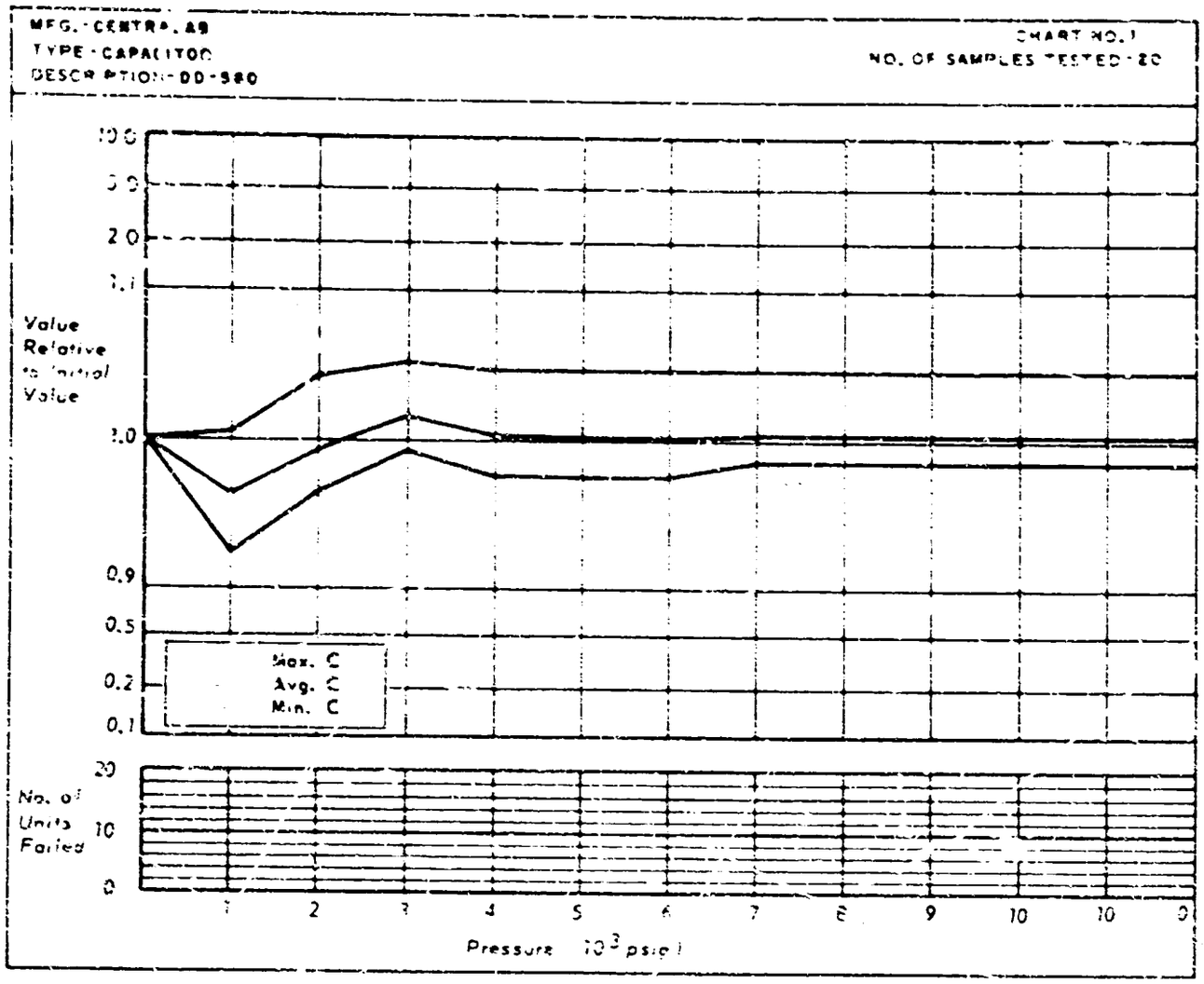
The maximum, minimum and average electrical characteristics of each component type are plotted versus pressure. The graphs are normalized to unit initial values before application of pressure.

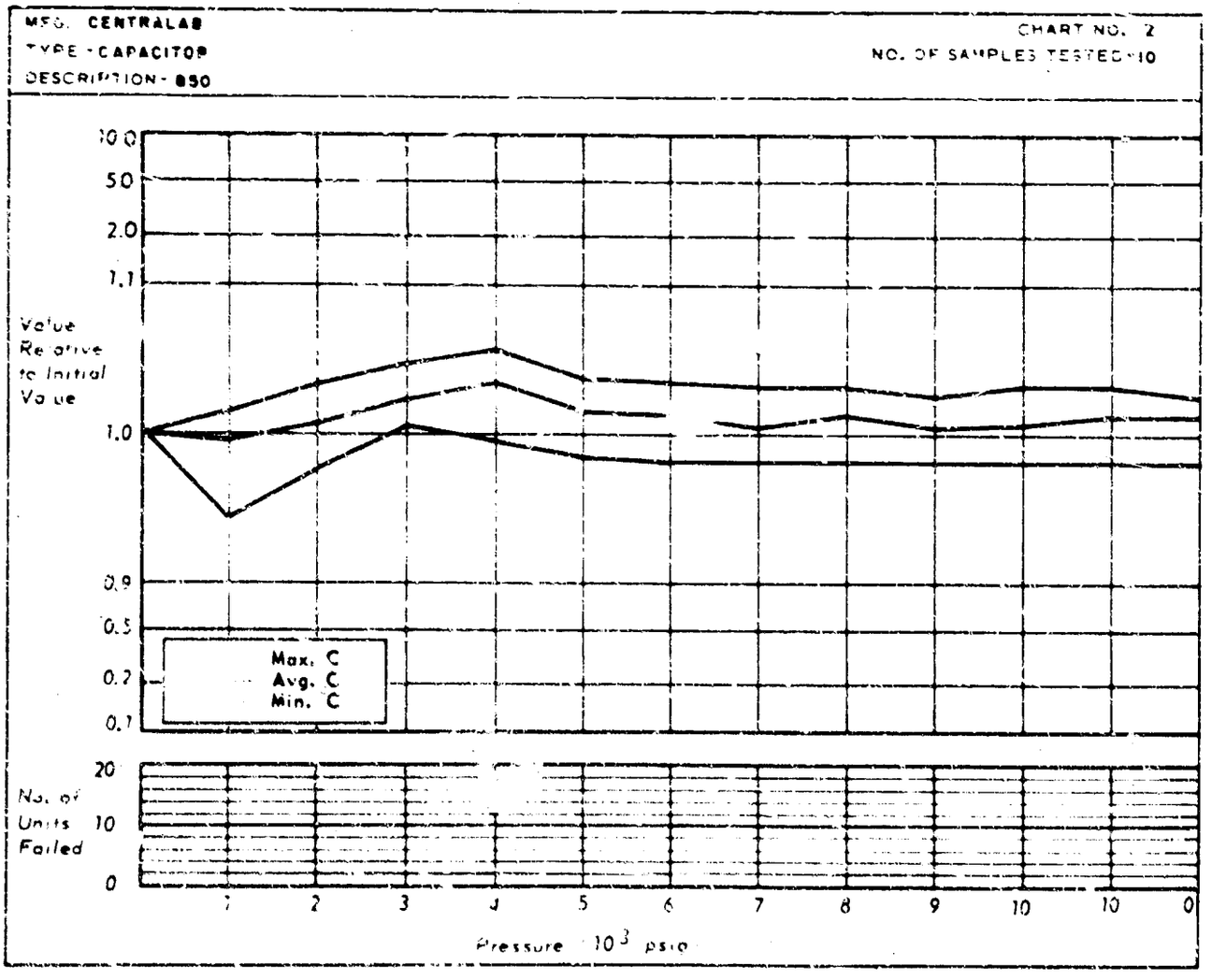
The ordinate of the graphs uses a composite of linear and log scales so that deviations of less than ±10% appear on a linear scale and deviations greater than ±10% are shown on a log scale. The exceptions to this form are the graphs for transistors and diodes. The accuracy of the readings for these components is of the order of ±10%; therefore, the entire ordinate uses a log scale to avoid exaggerating inherent reading errors.

As previously stated, components having a relative value change greater than 50% were considered a failure and dropped from the set in computing values at that pressure.

The number of failures for each test set are shown in a bar graph for each 1000 psig pressure increment. This graph shows failures in the pressure interval in which they appear. The percentage of failures can be determined by reference to the total number of components tested given at the top of each graph.

Each graph is accompanied on the facing page by a complete description of the component tested, a summary of changes in relative value, a review of any physical damage and, where appropriate, a photograph of any visual physical evidence of mechanical damage.


MFG. - CENTRALAB
TYPE - CAPACITOR
DESCRIPTION - DD-580
CHART NO. 1
NO. OF SAMPLES TESTED - 20
Value Relative to Initial Value
Max. C
Avg. C
Min. C
No. of Units Failed
Pressure (10³ psig)


MFG. CENTRALAB
TYPE - CAPACITOR
DESCRIPTION - 850
CHART NO. 2
NO. OF SAMPLES TESTED - 10
Value Relative to Initial Value
Max. C
Avg. C
Min. C
No. of Units Failed
Pressure (10³ psig)

| | | |
|---|---|---|
| Centralab | 56 pF ±10% | Ceramic, disc |
| DD-560 | 1000 VDCW | Radial lead |
| Capacitor | | 0.12 x 0.25" diam. |

SOAK PERIOD: 16 hours at 10,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Centralab | 100 pF ± 10% | Metal case |
| Type 850 | 5000 VDCW | Axial stud |
| Capacitor | | 0.65 x 0.812" diam. |

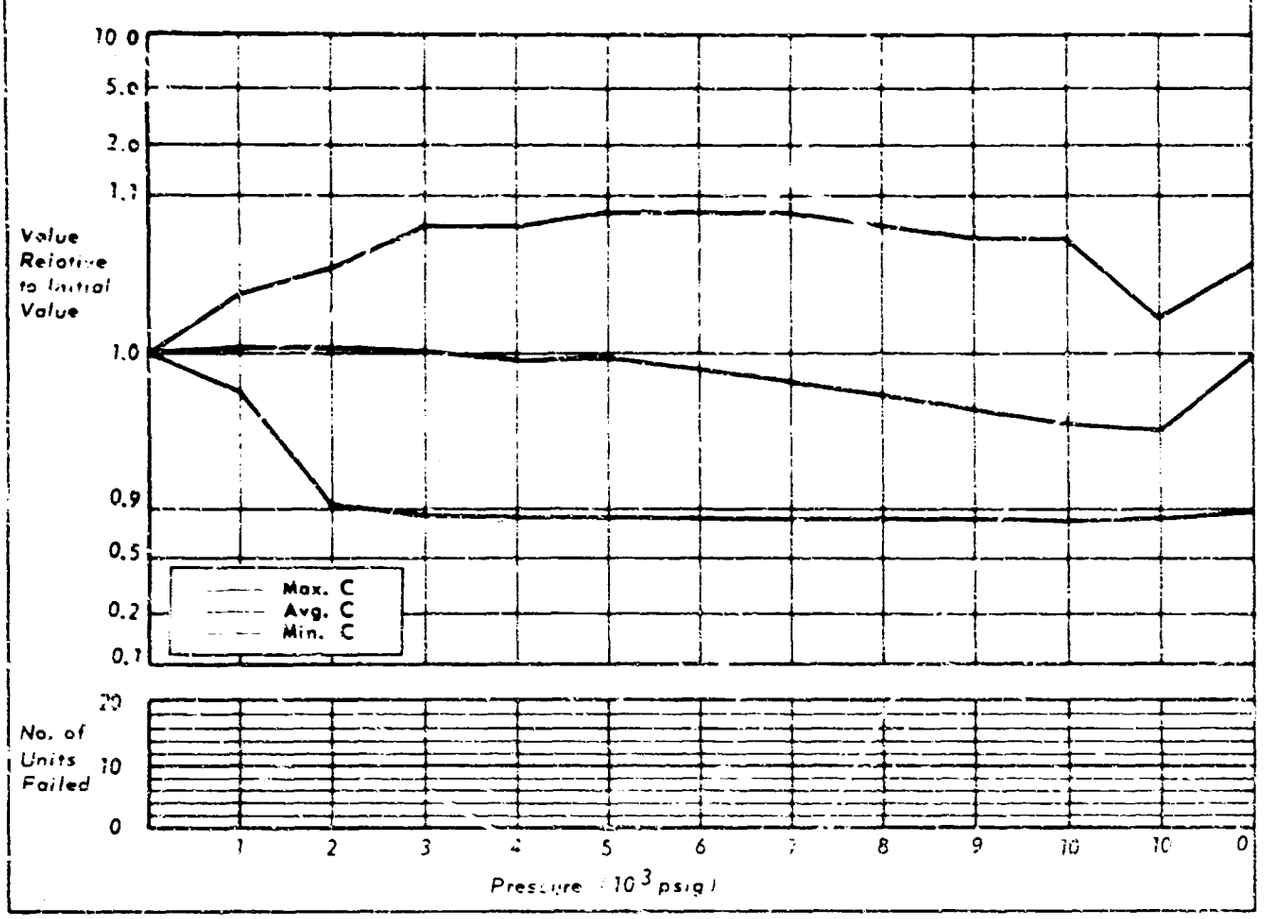
SOAK PERIOD: 16 hours at 7,000 psig.

MECHANICAL: No apparent damage

ELECTRICAL: All components indicated less than 10% change.

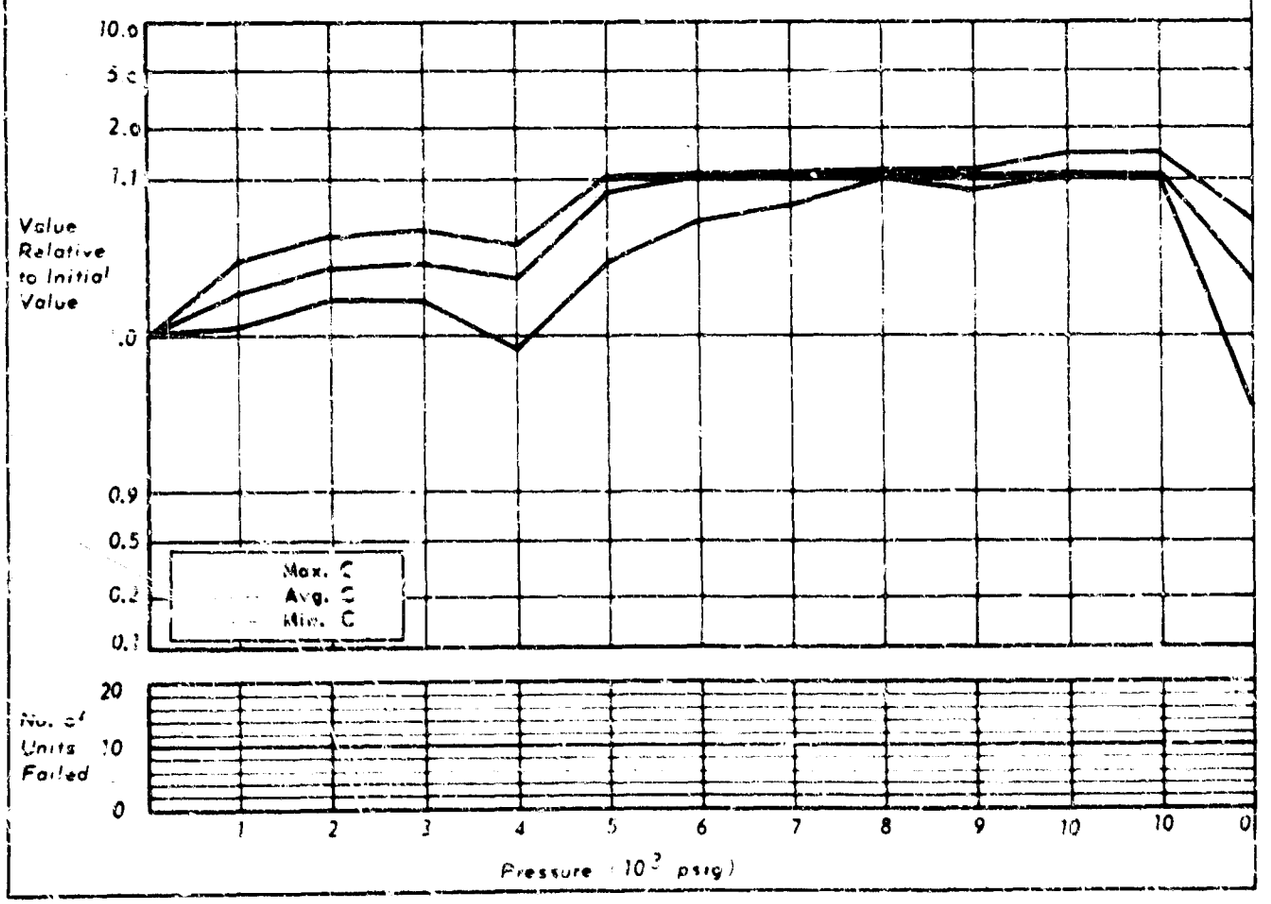
MFG. - CENTRALAB
TYPE - CAPACITOR, 761-C81Y, .001 µF 8MV, 500 VDCW
DESCRIPTION - CERAMIC FEED THRU, AXIAL LEAD

CHART NO. 3
NO. OF SAMPLES TESTED - 20




MFG. - CENTRALAB
TYPE - CAPACITOR, DA-203, .02 µF +100 -20 %, 30 VDCW
DESCRIPTION - CERAMIC DISK, RADIAL LEAD

CHART NO. 4
NO. OF SAMPLES TESTED - 13



| | | |
|---|---|---|
| Centralab | 0.001 μF GMV | Ceramic, feed through |
| 741-061Y | 500 VDC W | Tubular, axial lead |
| Capacitor | | 0.4 x 0.18" diam. |

SOAK PERIOD: None

MECHANICAL: No apparent damage

ELECTRICAL: Seventeen components indicated less than 10% change.
Three components indicated a change greater than 10% and less than 50%.

| | | |
|---|---|---|
| Centralab | 0.02 μF $\frac{+100}{-20}$ % | Ceramic, wafer |
| DA-203 | 30 VDCW | Square, radial lead |
| Capacitor | | 0.57 x 0.57 x 0.12" th. |

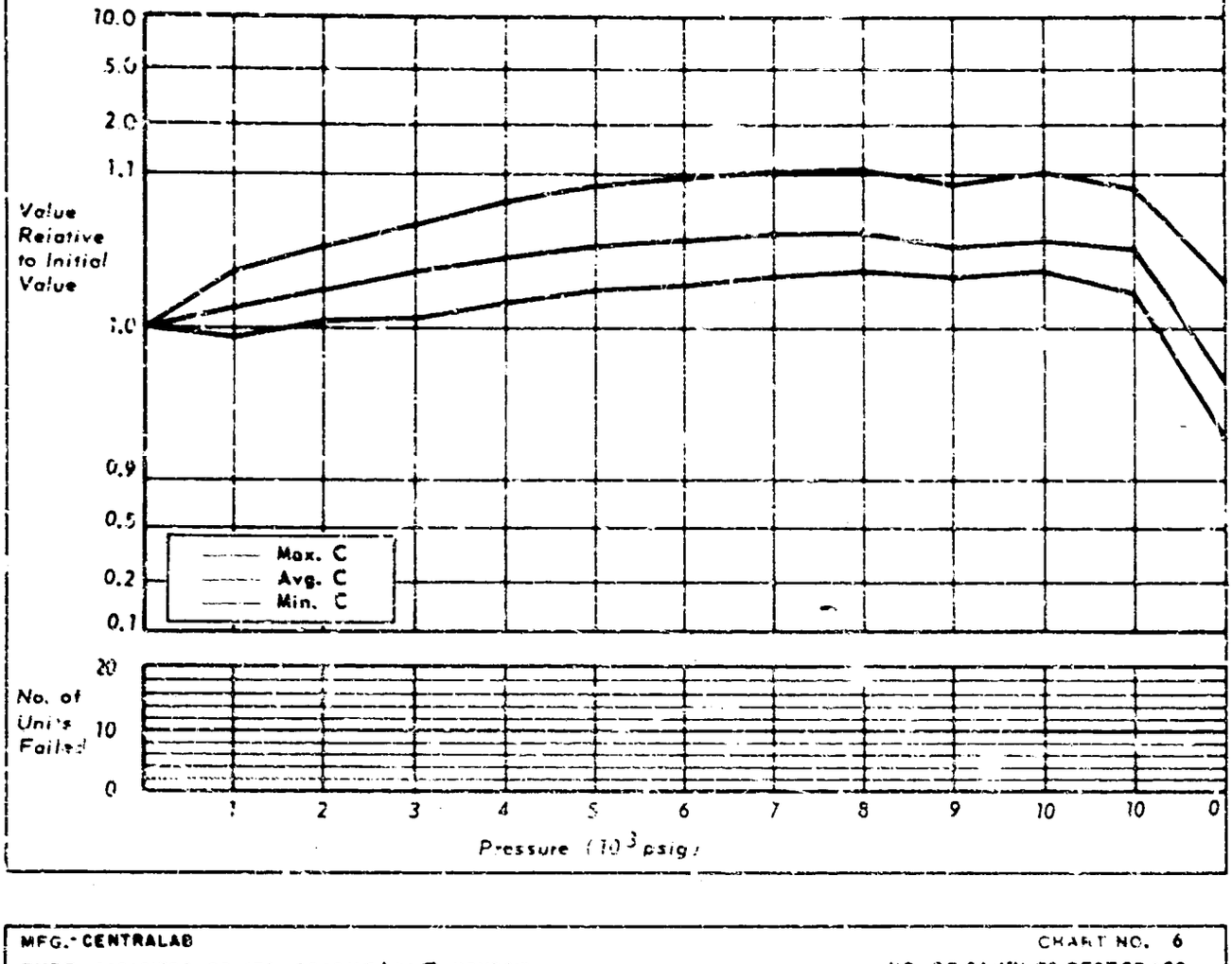
SOAK PERIOD: 16 hours at 3,000 psig.

MECHANICAL: No apparent damage

ELECTRICAL: All components indicated a change greater than 10% and less than 50%.

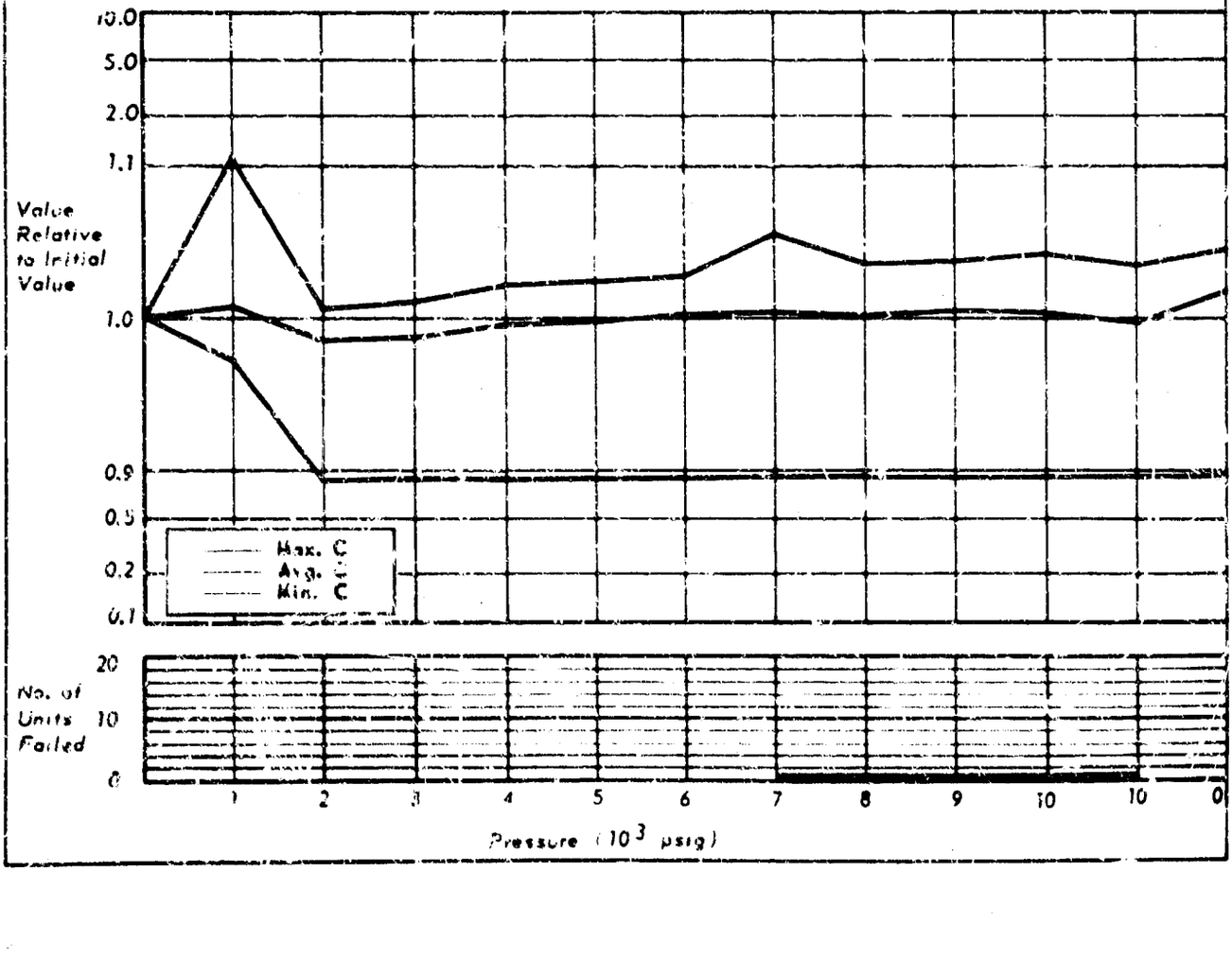
MFG.- CENTRALAB
TYPE - CAPACITOR, DD-203, .02 μF +80 -20 %, 600VDCW
DESCRIPTION - CERAMIC DISK, RADIAL LEADS

CHART NO. 5
NO. OF SAMPLES TESTED - 20




MFG.- CENTRALAB
TYPE - CAPACITOR, DD-472, .0047 μF ± 20 %, 75VDCW
DESCRIPTION - CERAMIC DISK, RADIAL LEADS

CHART NO. 6
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Centralab | 0.02 $\mu$F $^{+80}_{-20}$ % | Ceramic, disc |
| DD-203 | 600 VDCW | Radial lead |
| Capacitor | | 0.13 x 0.61" diam. |

SOAK PERIOD: 16 hours at 3,000 psig.

MECHANICAL: No apparent damage

ELECTRICAL: Nineteen components indicated less than 10% change.

One component indicated a change greater than 10% with subsequent recovery to less than 10% change on return to 0 psig.

| | | |
|---|---|---|
| Centralab | 0.0047 $\mu$F ± 20% | Ceramic, disc |
| DD-472 | 75 VDCW | Radial lead |
| Capacitor | | 0.12 x 0.55" diam. |

SOAK PERIOD: 16 hours at 3,000 psig.

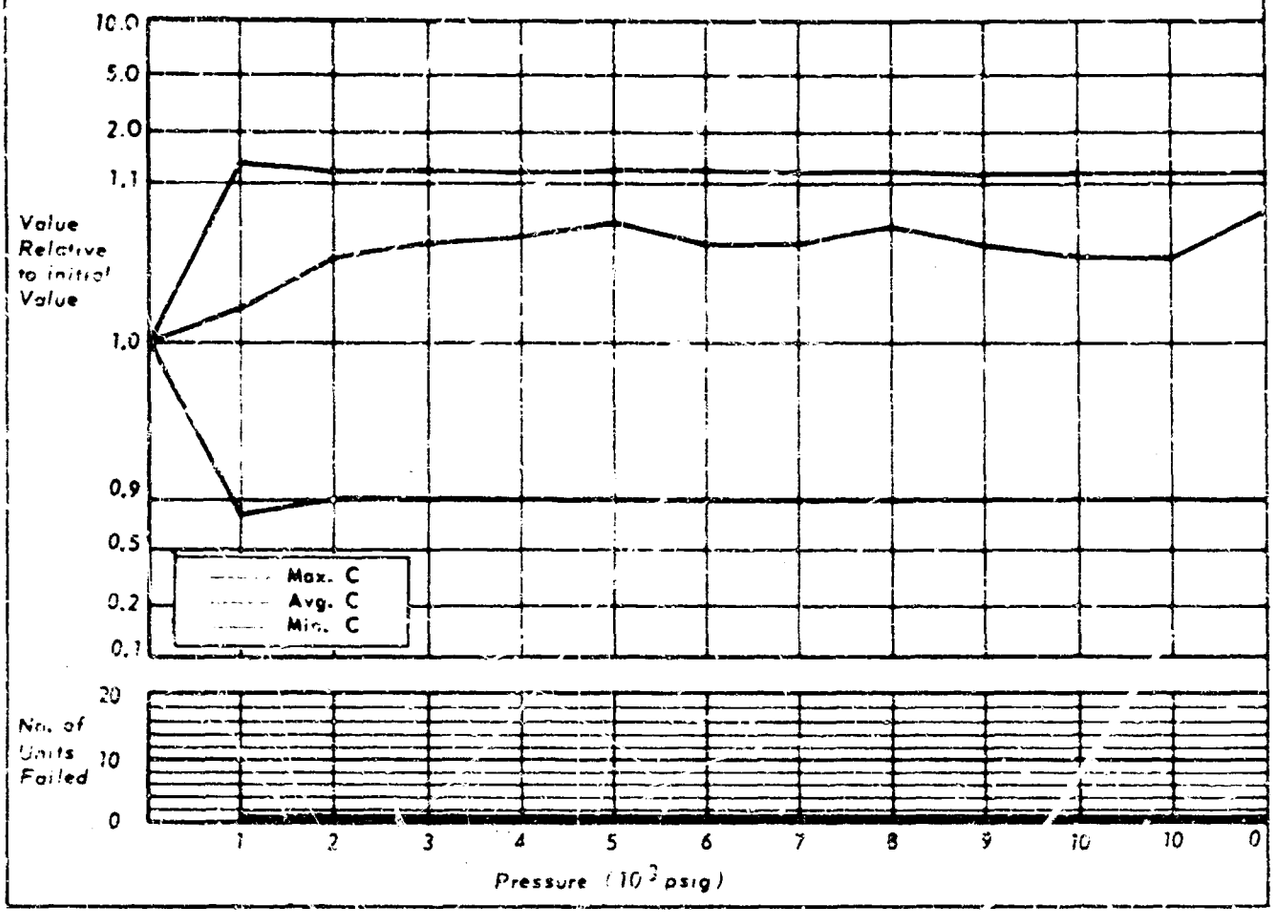
MECHANICAL: No apparent damage.

ELECTRICAL: Nineteen components indicated less than 10% change.

FAILURES: One component indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.

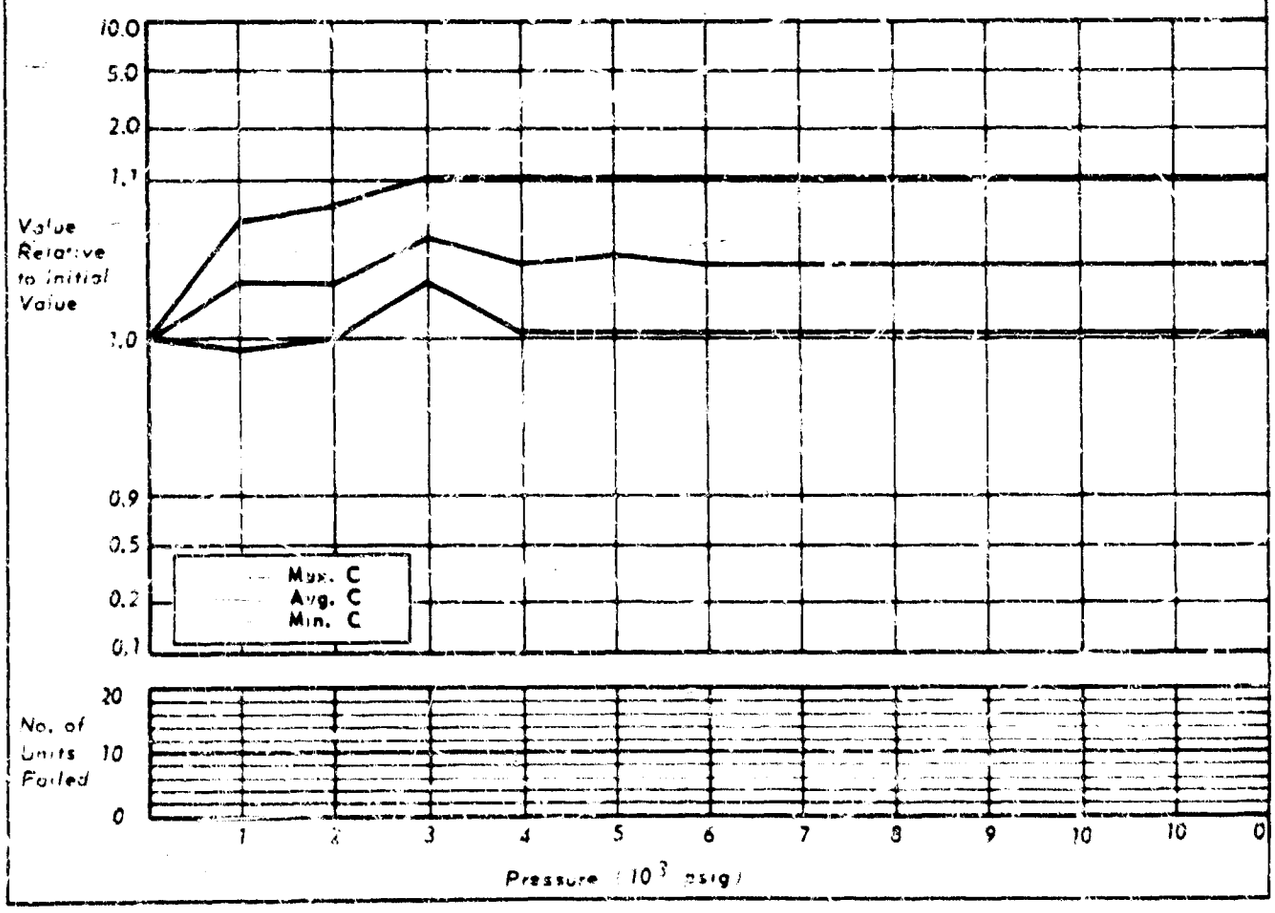
MFG. - CENTRALAB
TYPE - CAPACITOR
DESCRIPTION - DDA-104

CHART NO. 7
NO. OF SAMPLES TESTED - 20




MFG. - CENTRALAB
TYPE - CAPACITOR
DESCRIPTION - CVII0450

CHART NO. 8
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Centralab | 0.1 μF $^{+80}_{-30}$ % | Ceramic, disc |
| DDA-104 | 75 VDCW | Wax impreg |
| Capacitor | | 0.2 x 0.65" diam. |

SOAK PERIOD: 15.5 hours at 3,000 psig.

MECHANICAL: One component was damaged as shown in accompanying photograph.

ELECTRICAL: Nineteen components indicated less than 10% change.

FAILURES: One component indicated a permanent change greater than 50% at the press... shown on the failure graph on opposite page.

| | | |
|---|---|---|
| Centralab | 7 to 45 pF | Ceramic, trimmer |
| CV11D450 | 600 VDCW | Chassis mount, radial lug |
| Capacitor, variable | | 0.64 x 0.84" diam. |

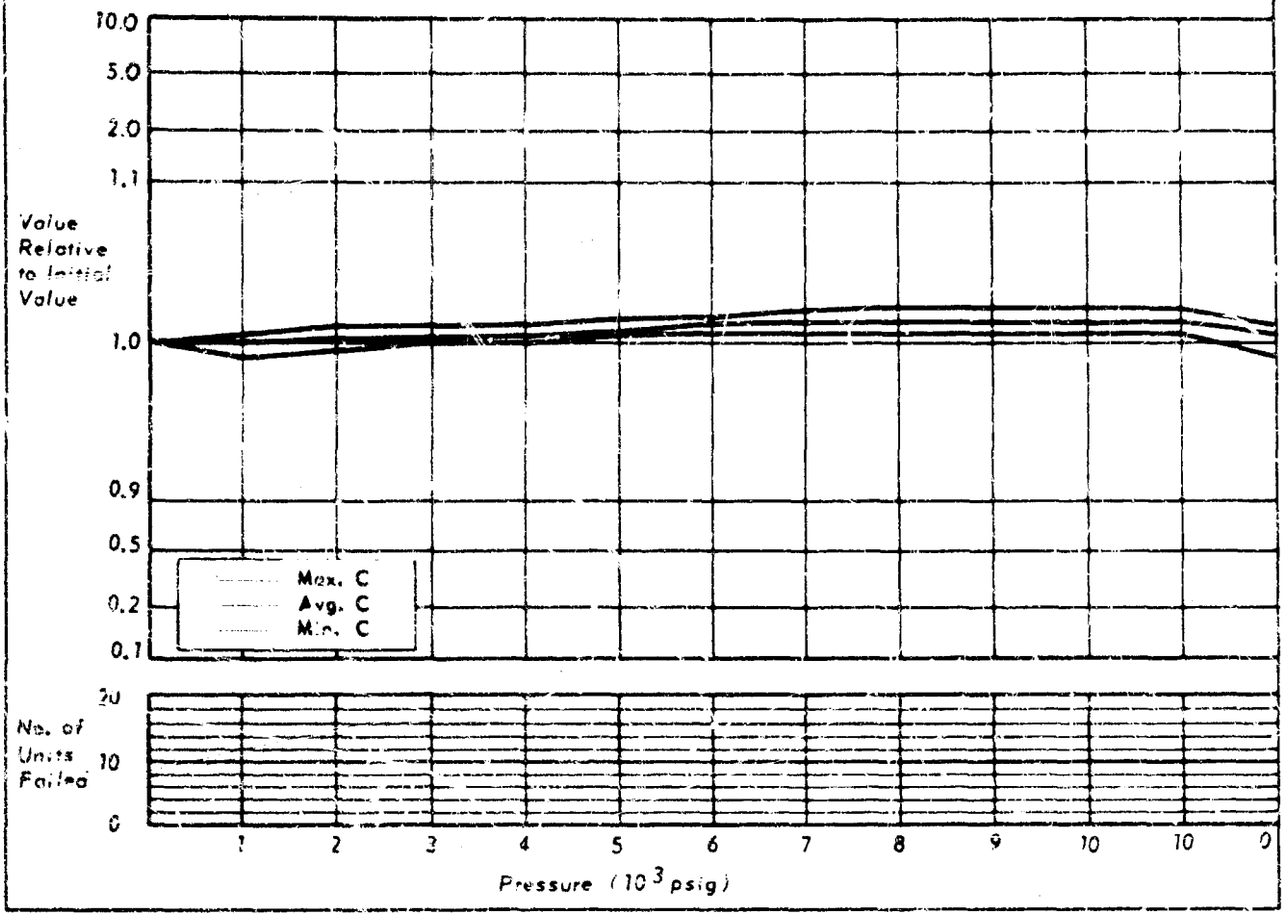
SOAK PERIOD: 15 hours at 10,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

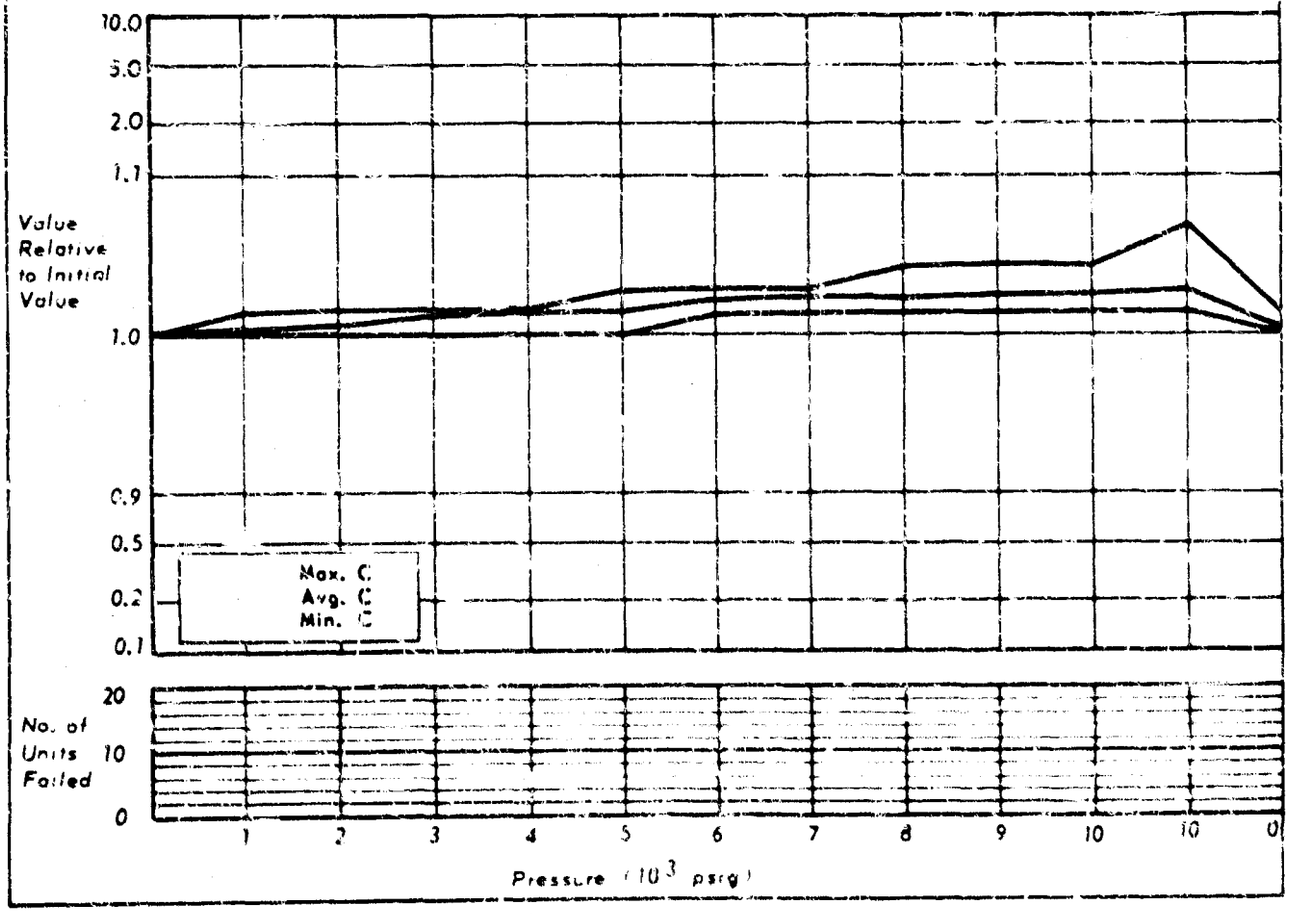
MFG. - CORNELL-DUBLIER
TYPE - CAPACITOR, DPMS 1522, .002 μF ± 20%, 100 VDCW
DESCRIPTION - PAPER FILM, TUBULAR, RADIAL LEADS

CHART NO. 9
NO. OF SAMPLES TESTED - 19




MFG. - CORNELL-DUBLIER
TYPE - CAPACITOR, DPMS 606, .006 μF ± 20%, 600 VDCW
DESCRIPTION - PAPER FILM, TUBULAR, RADIAL LEADS

CHART NO. 10
NO. OF SAMPLES TESTED - 19



| | | |
|---|---|---|
| Cornell-Dubilier | 0.002 μF ± 20% | Paper, mylar |
| DPMS 1522 | 100 VDCW | Tubular, radial lead |
| Capacitor | | Dipped casing |
| | | 0.63 x 0.37" diam. |

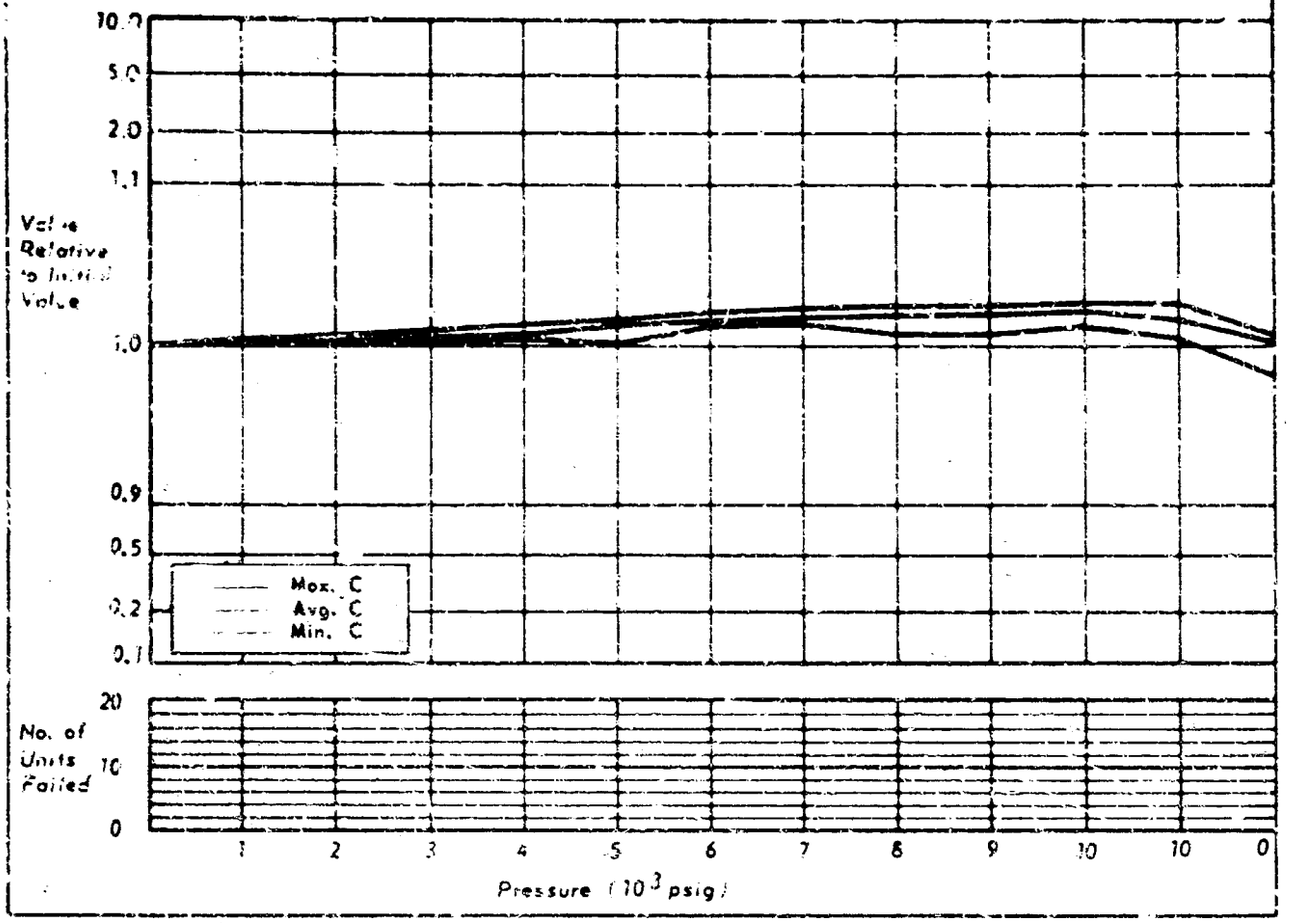
SOAK PERIOD: 15 hours at 8,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Cornell-Dubilier | 0.006 μF ± 2% | Paper, mylar |
| DPMS 6D6 | 600 VDCW | Tubular, radial lead |
| Capacitor | | Dipped casing |
| | | 0.69 x 0.34" diam. |

SOAK PERIOD: 16 hours at 8,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

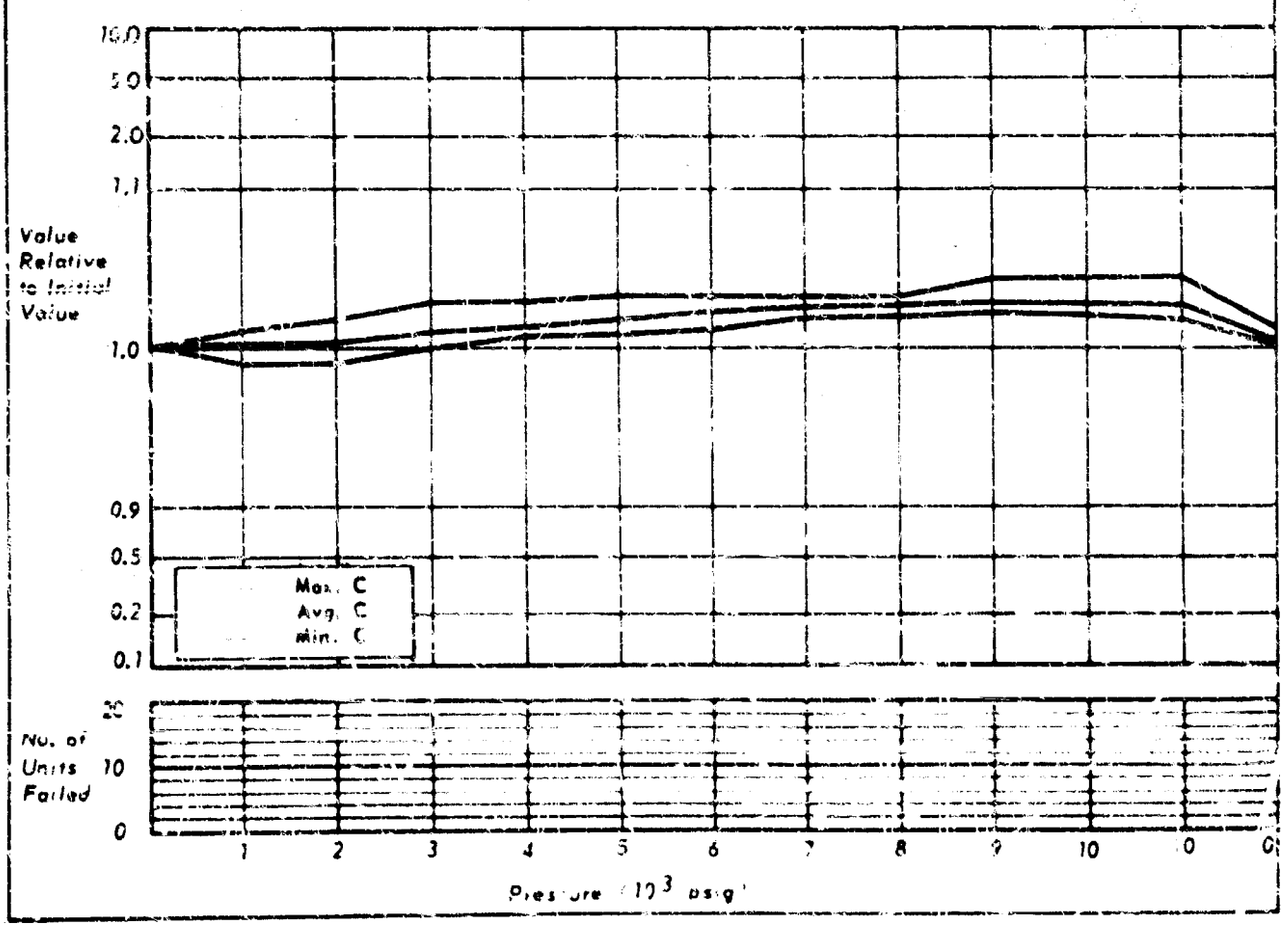
MFG. - CORNELL-DUBLIER
TYPE - CAPACITOR, DPMS 1833, .033 μF ± 20%, 100 VDCW
DESCRIPTION - PAPER FILM, TUBULAR, RADIAL LEADS

CHART NO. 11
NO. OF SAMPLES TESTED - 20




MFG. - CORNELL-DUBLIER
TYPE - CAPACITOR, DPMS 4P1, .1 μF ± 20%, 600 VDCW
DESCRIPTION - PAPER FILM, TUBULAR, RADIAL LEADS

CHART NO. 12
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Cornell-Dubilier | 0.033 μF ± 20% | Paper, mylar |
| DPMS 1533 | 500 VDCW | Tubular, radial lead |
| Capacitor | | Dipped casing |
| | | 0.63 x 0.37" diam. |

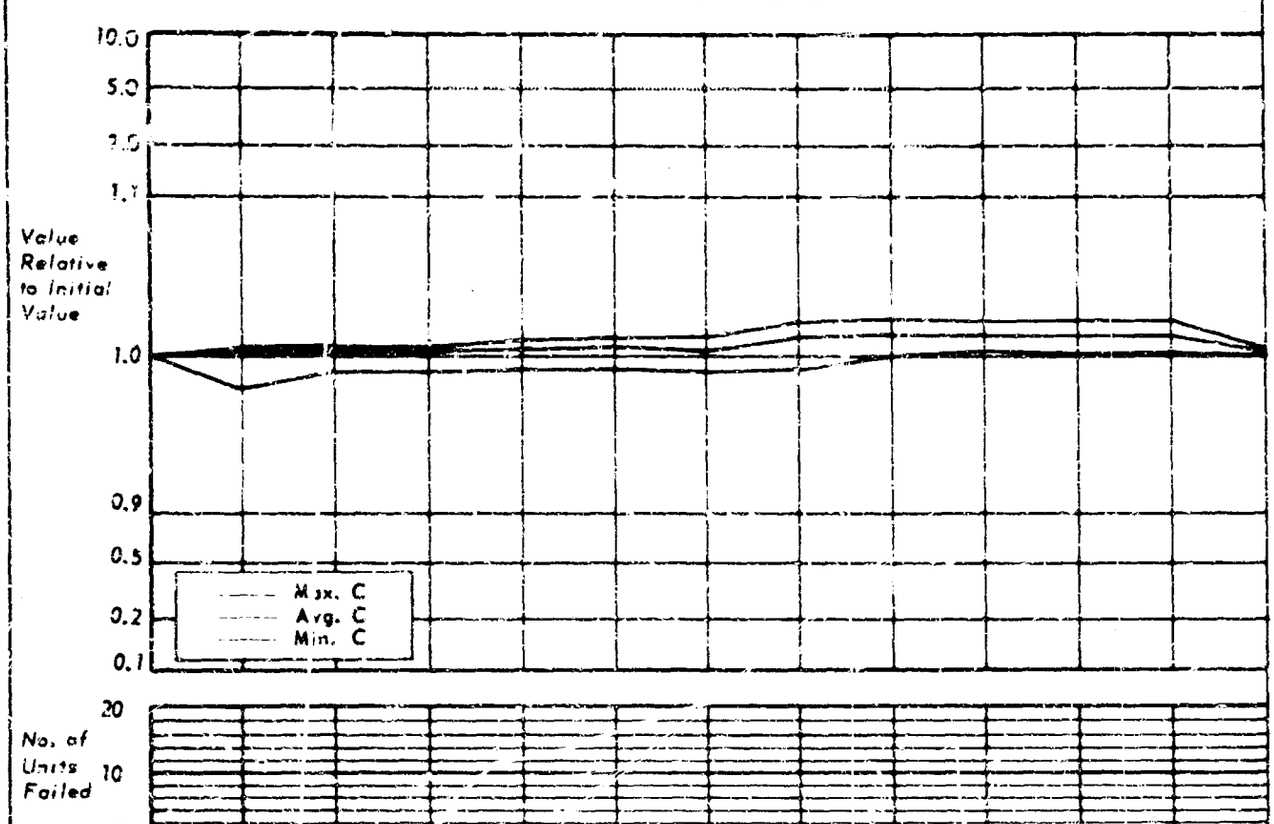
SOAK PERIOD: 16 hours at 8,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Cornell-Dubilier | 0.1 μF ± 20% | Paper, mylar |
| DPMS 4P1 | 500 VDCW | Tubular, radial lead |
| Capacitor | | Dipped casing |
| | | 0.52 x 1.18" diam. |

SOAK PERIOD: 16 hours at 10,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

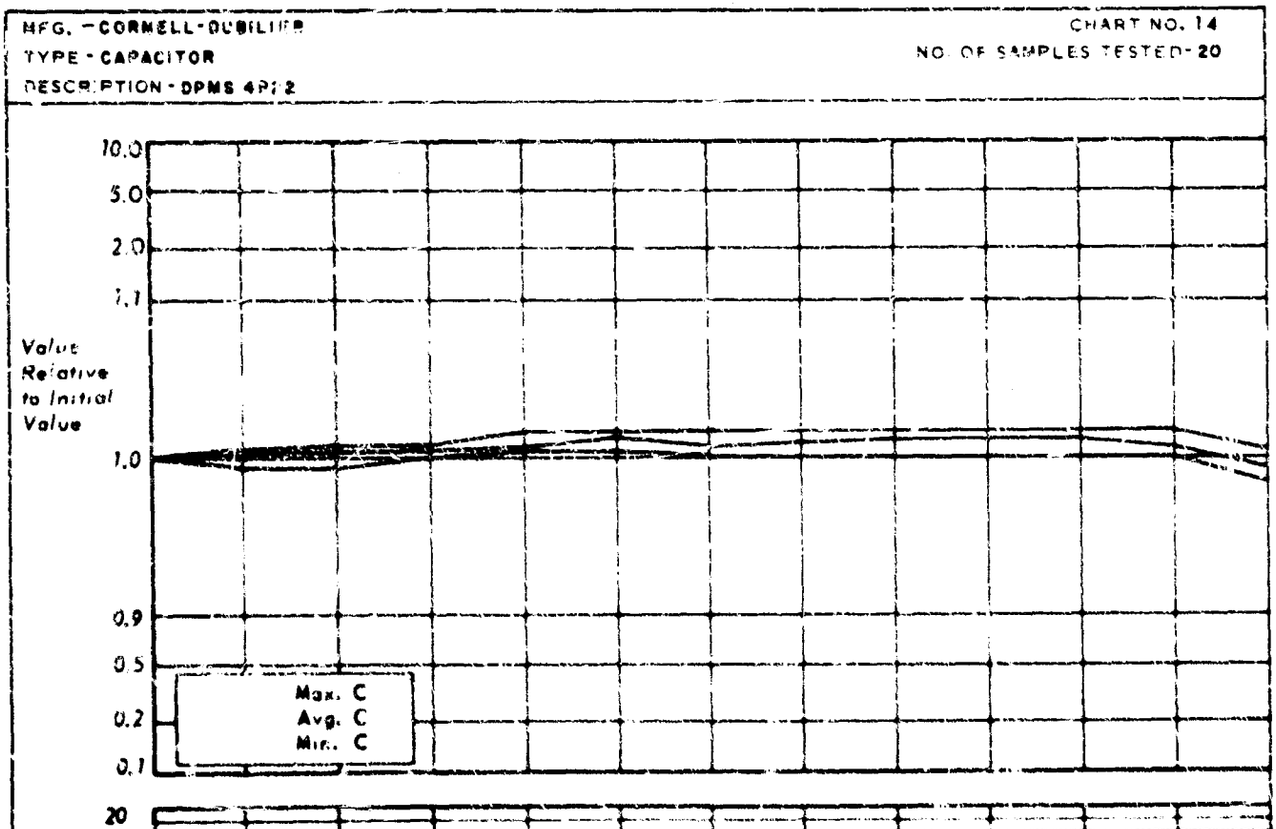
MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - DPMS 2P22

CHART NO. 13
NO. OF SAMPLES TESTED - 20




MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - DPMS 4P22

CHART NO. 14
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Cornell-Dubilier | 0.22 $\mu$F ± 20% | Paper, mylar |
| DPMS 2P22 | 200 VDCW | Tubular, radial lead |
| Capacitor | | Dipped casing |
| | | 1.3 x 0.59" diam. |

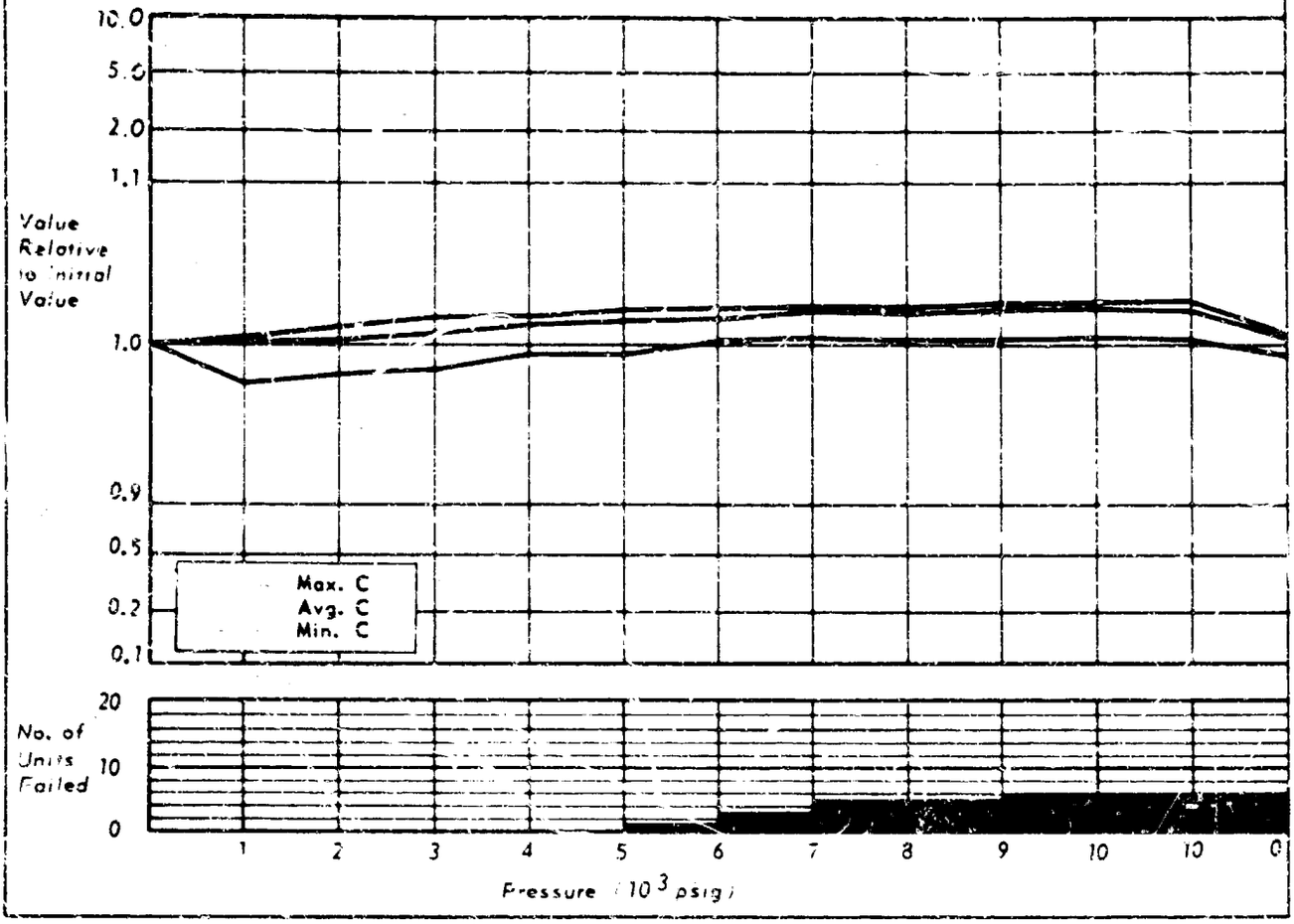
SOAK PERIOD: 16 hours at 10,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Cornell-Dubilier | 0.22 $\pm\mu$F ± 20% | Paper, mylar |
| DPMS 4P22 | 400 VDCW | Tubular, radial lead |
| Capacitor | | Dipped casing |
| | | 1.56 x 0.62" diam. |

SOAK PERIOD: 16 hours at 10,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

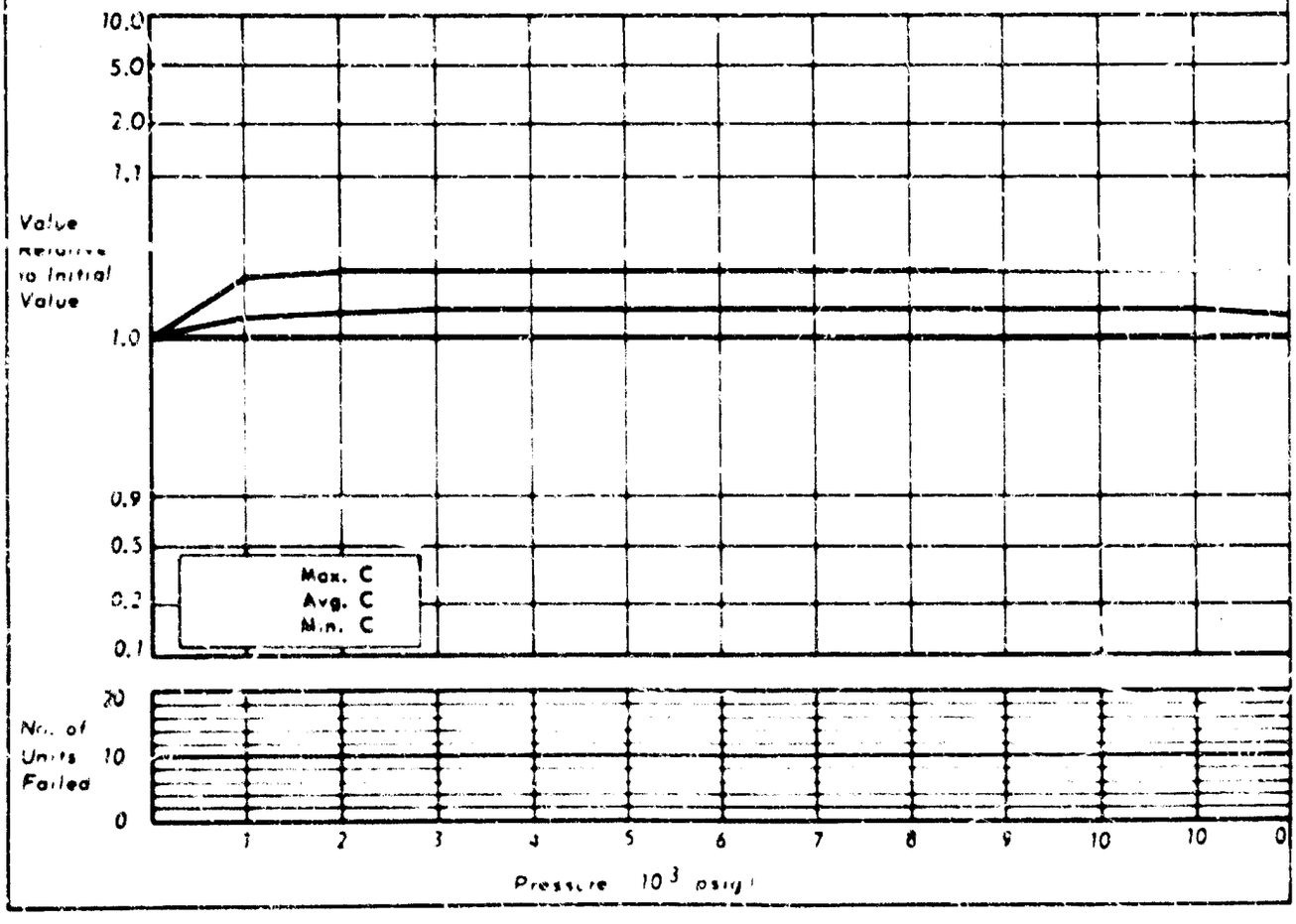
MFG. - CORNELL-DUBLIER
TYPE - CAPACITOR, DPMS 2P47, .47 μF ±20%, 200 VDCW
DESCRIPTION - PAPER FILM, TUBULAR, RADIAL LEADS

CHART NO. 15
NO. OF SAMPLES TESTED - 20




MFG. - CORNELL-DUBLIER
TYPE - CAPACITOR, PKM 402, .002 μF ±20%, 400 VDCW
DESCRIPTION - SOLID IMPREG., TUBULAR, AXIAL LEAD

CHART NO. 16
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Cornell-Dubilier | 0.47 μF ± 20% | Paper, mylar |
| DPMS 2P47 | 200 VDCW | Tubular, radial lead |
| Capacitor | | Dipped coating |
| | | 1.6 x 0.73" diam |

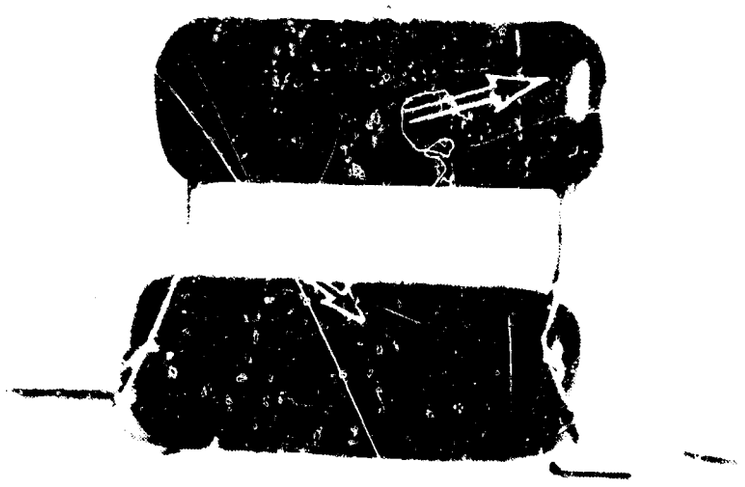
**SOAK PERIOD:** None

**MECHANICAL:** Visual inspection after completion of test showed hairline cracks in the casing of three units and a chipped casing on one unit.

**ELECTRICAL:** Fourteen components indicated less than 10% change.

One component indicated a change greater than 50% with subsequent recovery at pressures shown on failure graph on opposite page.

**FAILURES:** Five components indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.



| | | |
|---|---|---|
| Cornell-Dubilier | 0.002 μF ± 20% | Solid impreg |
| PKM4D2 | 400 VDCW | Tubular, axial lead |
| Capacitor | | Thermoset molded |
| | | 1.0 x 0.32" diam |

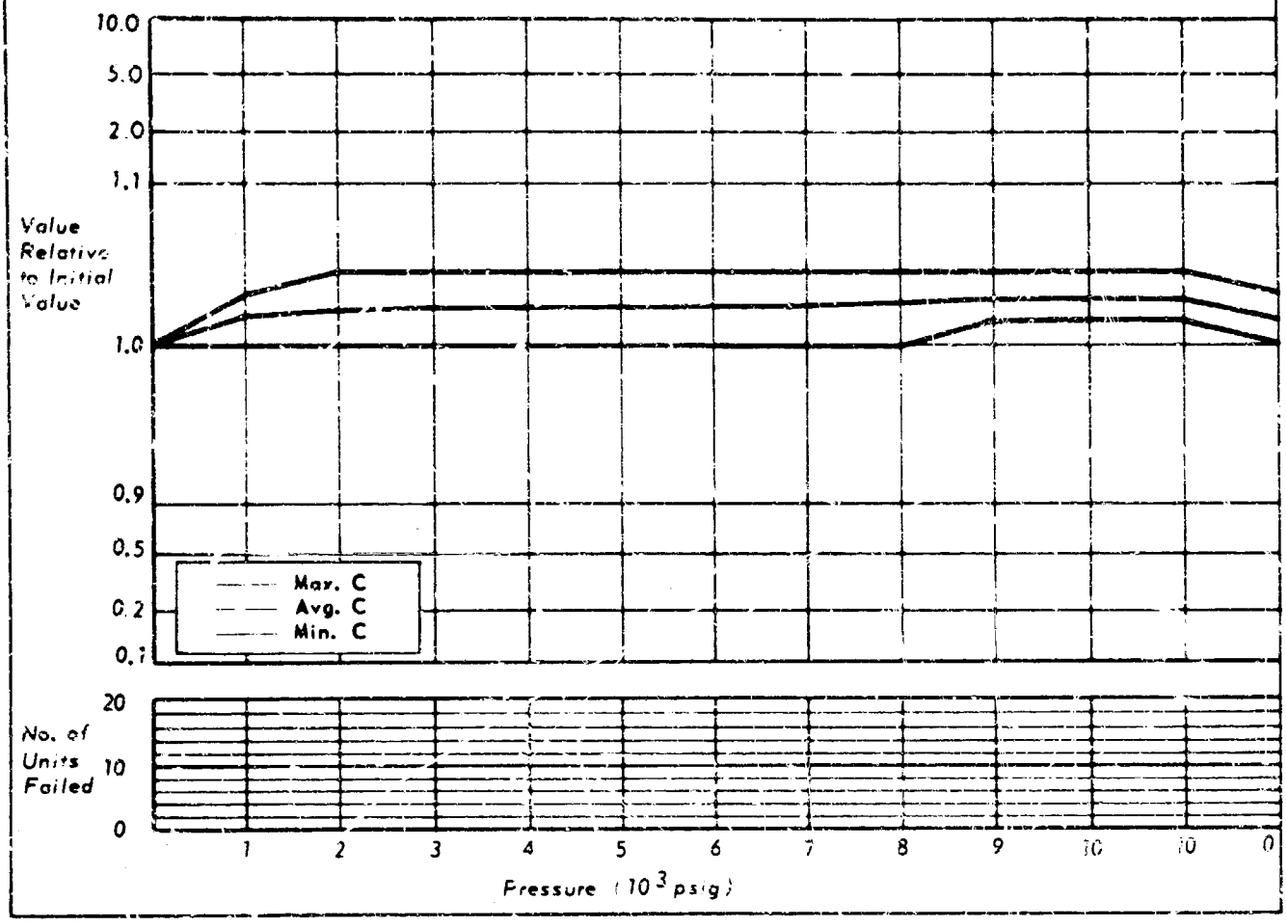
**SOAK PERIOD:** None

**MECHANICAL:** No apparent damage

**ELECTRICAL:** All components indicated less than 10% change.

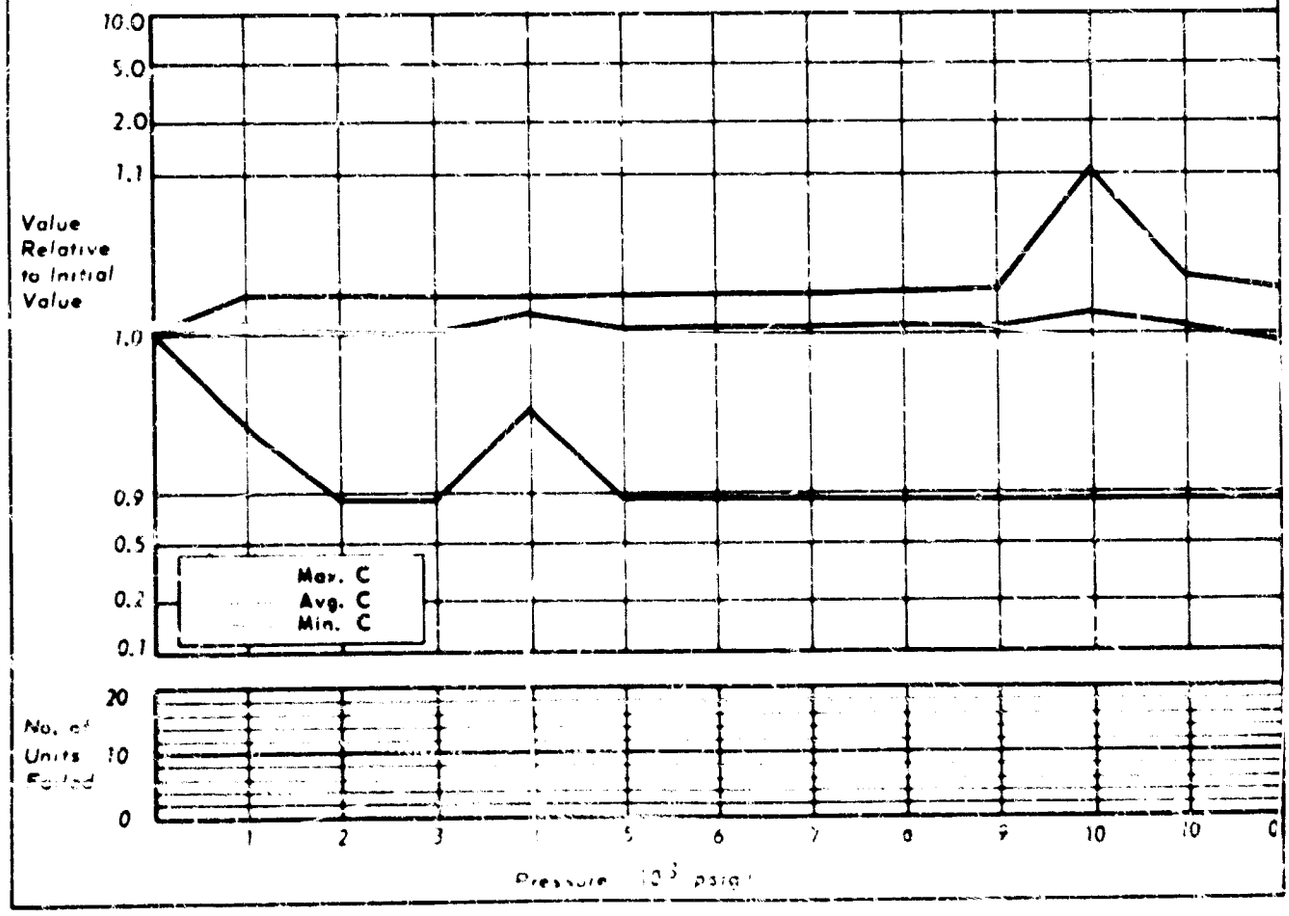
MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - PKM6D6

CHART NO. 17
NO. OF SAMPLES TESTED - 19




MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - PKM4B5

CHART NO. 18
NO. OF SAMPLES TESTED - 19



| | | |
|---|---|---|
| Cornell-Dubilier | 0.006 μF ± 20% | Solid impreg |
| PKM 6D6 | 600 VDCW | Tubular, axial lead |
| Capacitor | | Thermoset molded |
| | | 1.9 x 0.32" diam. |

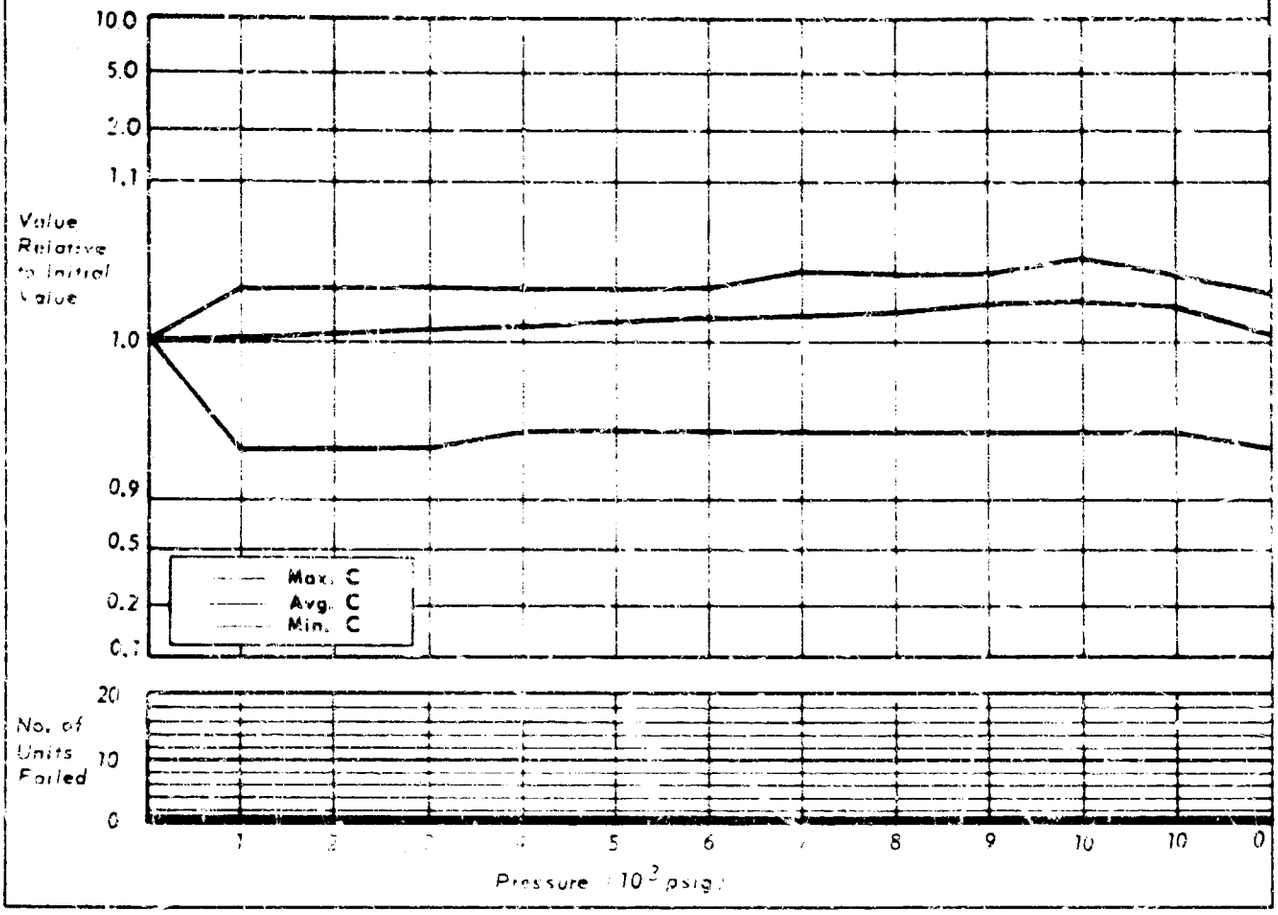
SOAK PERIOD: None
MECHANICAL: No apparent damage
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Cornell-Dubilier | 0.05 μF ± 20% | Solid impreg |
| PKM 4S5 | 400 VDCW | Tubular, axial lead |
| Capacitor | | Thermoset molded |
| | | 1.25 x 0.437" diam. |

SOAK PERIOD: None
MECHANICAL: No apparent damage
ELECTRICAL: Eighteen components indicated less than 10% change.
One component indicated a change greater than 10% and less than 50%.

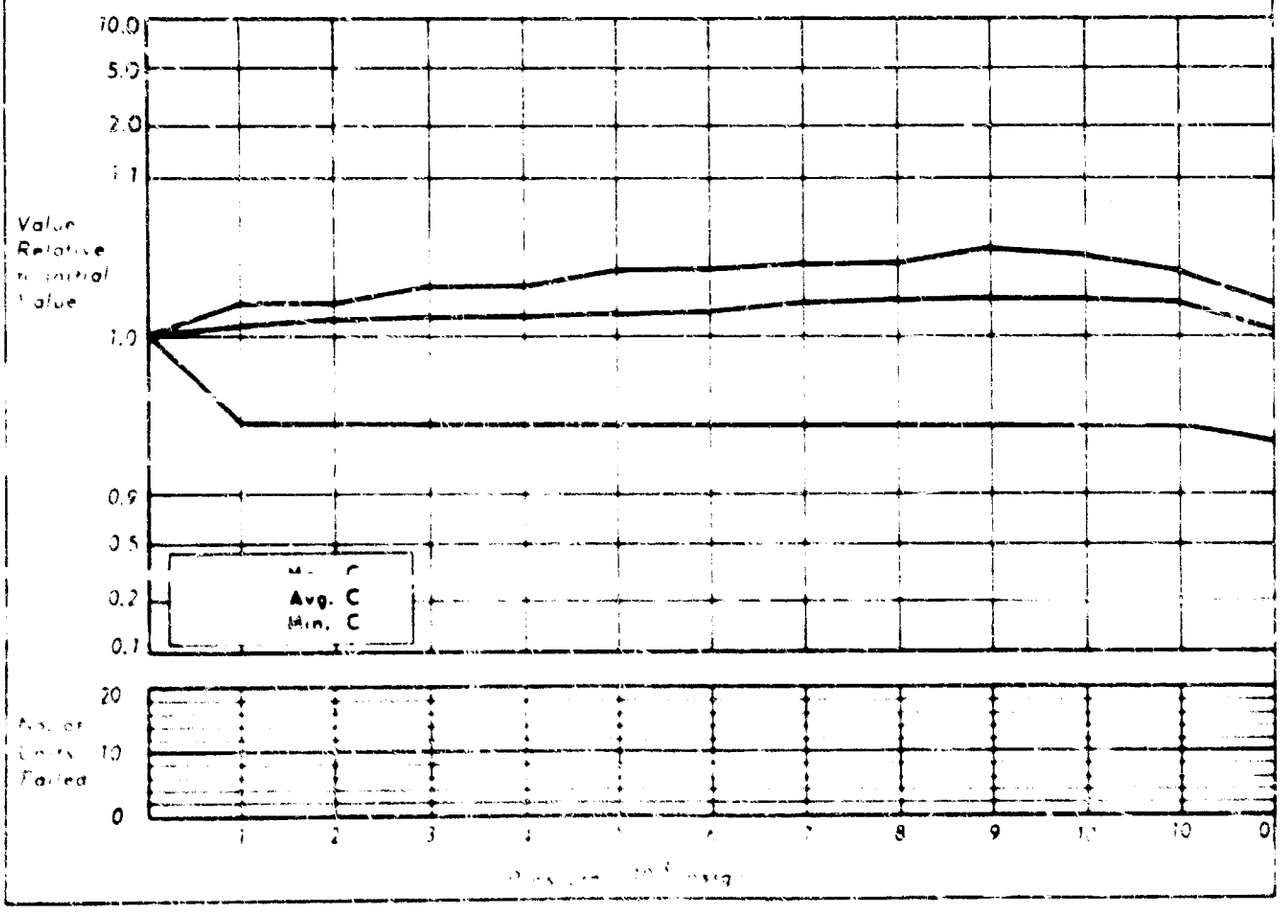
MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - PKM2P1

CHART NO. 19
NO. OF SAMPLES TESTED - 19




MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - PKM8P1

CHART NO. 20
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Cornell-Dubilier | 0.1 $\mu$F ± 20% | Solid impreg |
| PKM 2P1 | 200 VDCW | Tubular, axial lead |
| Capacitor | | Thermoset molded |
| | | 1.5 x 0.5" diam. |

**SOAK PERIOD:** 15 hours at 10,000 psig

**MECHANICAL:** No apparent damage

**ELECTRICAL:** Eighteen components indicated less than 10% change.

**FAILURES:** One component indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.

| | | |
|---|---|---|
| Cornell-Dubilier | 0.1 $\mu$F ± 20% | Solid impreg |
| PKM 6P1 | 600 VDCW | Tubular, axial lead |
| Capacitor | | Thermoset molded |
| | | 1.0 x 0.32" diam. |

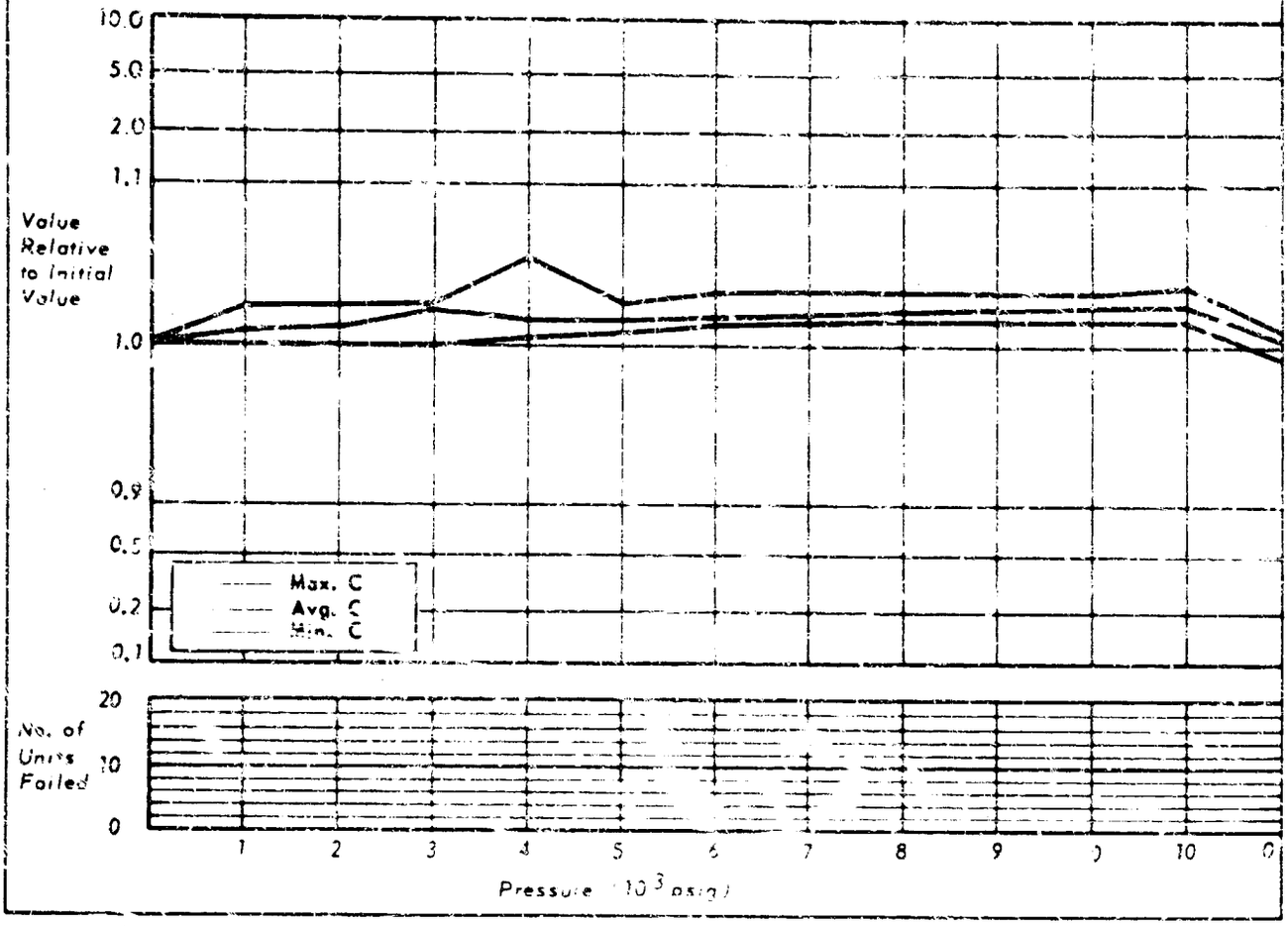
**SOAK PERIOD:** None

**MECHANICAL:** No apperen. damage

**ELECTRICAL:** All components indicated less than 10% change.

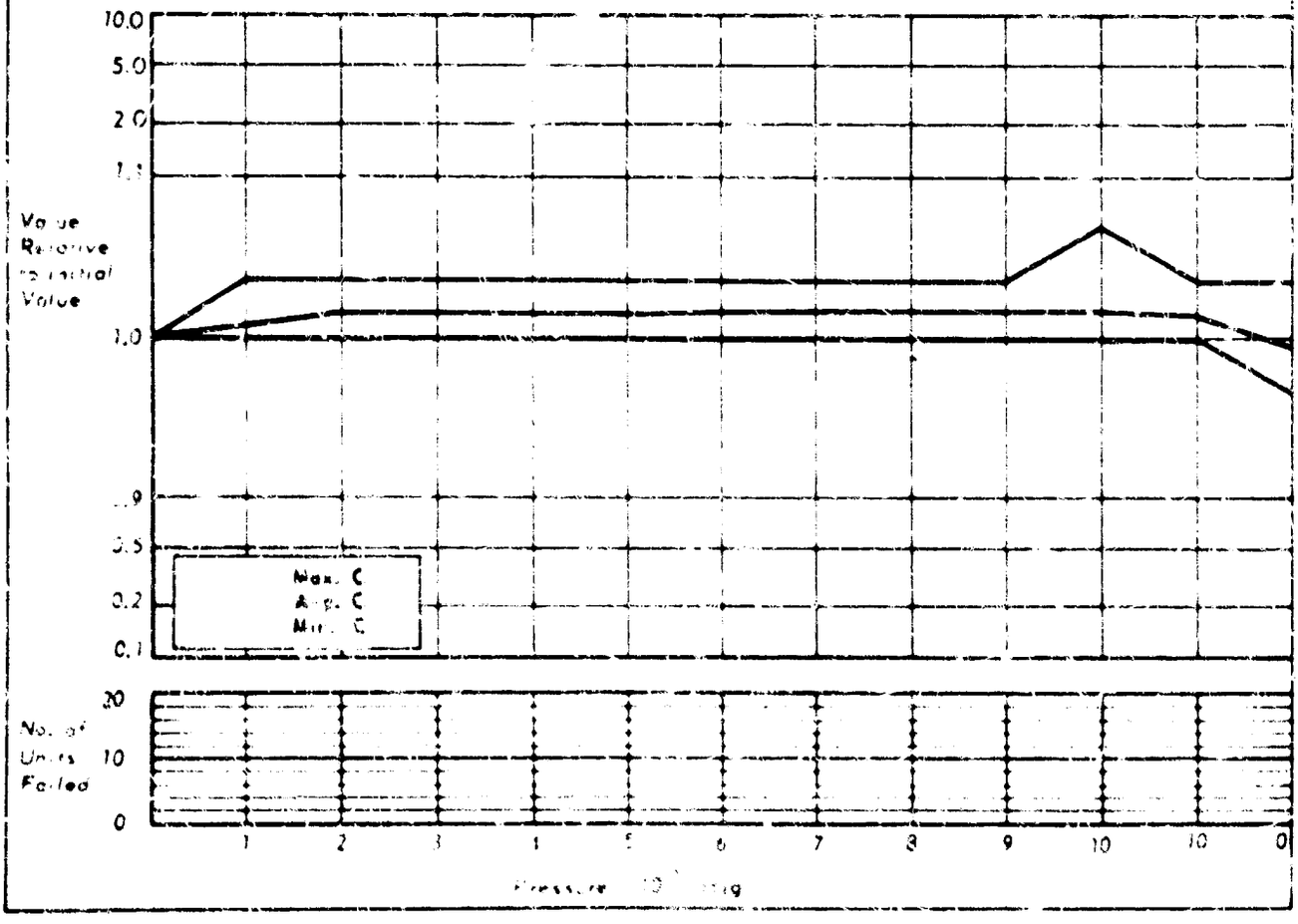
MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - PXM2P25

CHART NO. 21
NO. OF SAMPLES TESTED - 20




MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - PXM6P5

CHART NO. 22
NO. OF SAMPLES TESTED - 19



| | | |
|---|---|---|
| Cornell-Dubilier | 0.25 μF ± 20% | Solid impreg |
| PKM 2P25 | 200 VDCW | Tubular, axial lead |
| Capacitor | | Thermoset molded |
| | | 1.87 x 0.62" diam. |

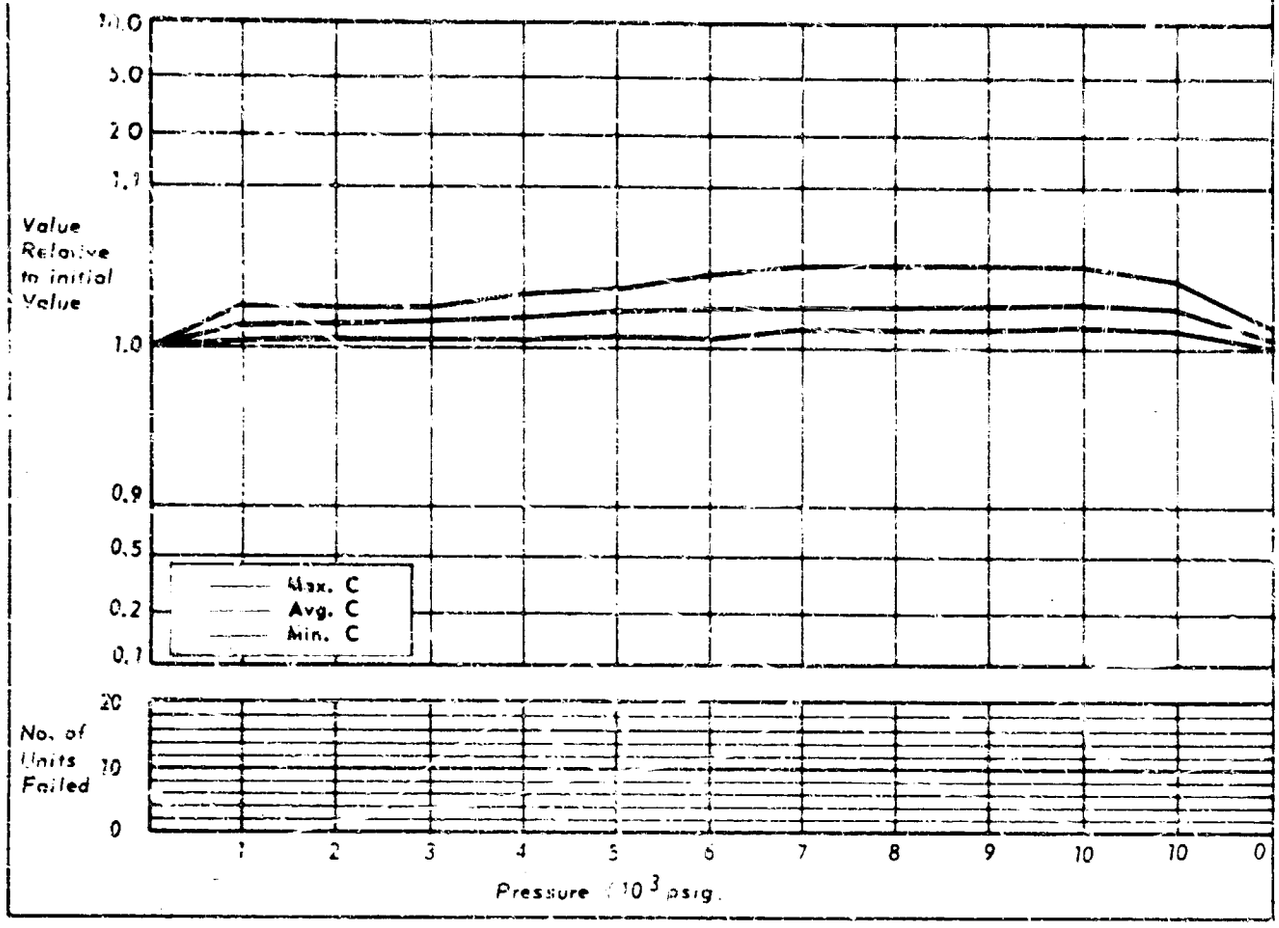
SOAK PERIOD: 16 hours at 8,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Cornell-Dubilier | 0.3 μF ± 20% | Solid impreg |
| PKM 6P3 | 600 VDCW | Tubular, axial lead |
| Capacitor | | Thermoset molded |
| | | 1.56 x 0.56" diam. |

SOAK PERIOD: 16 hours at 10,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

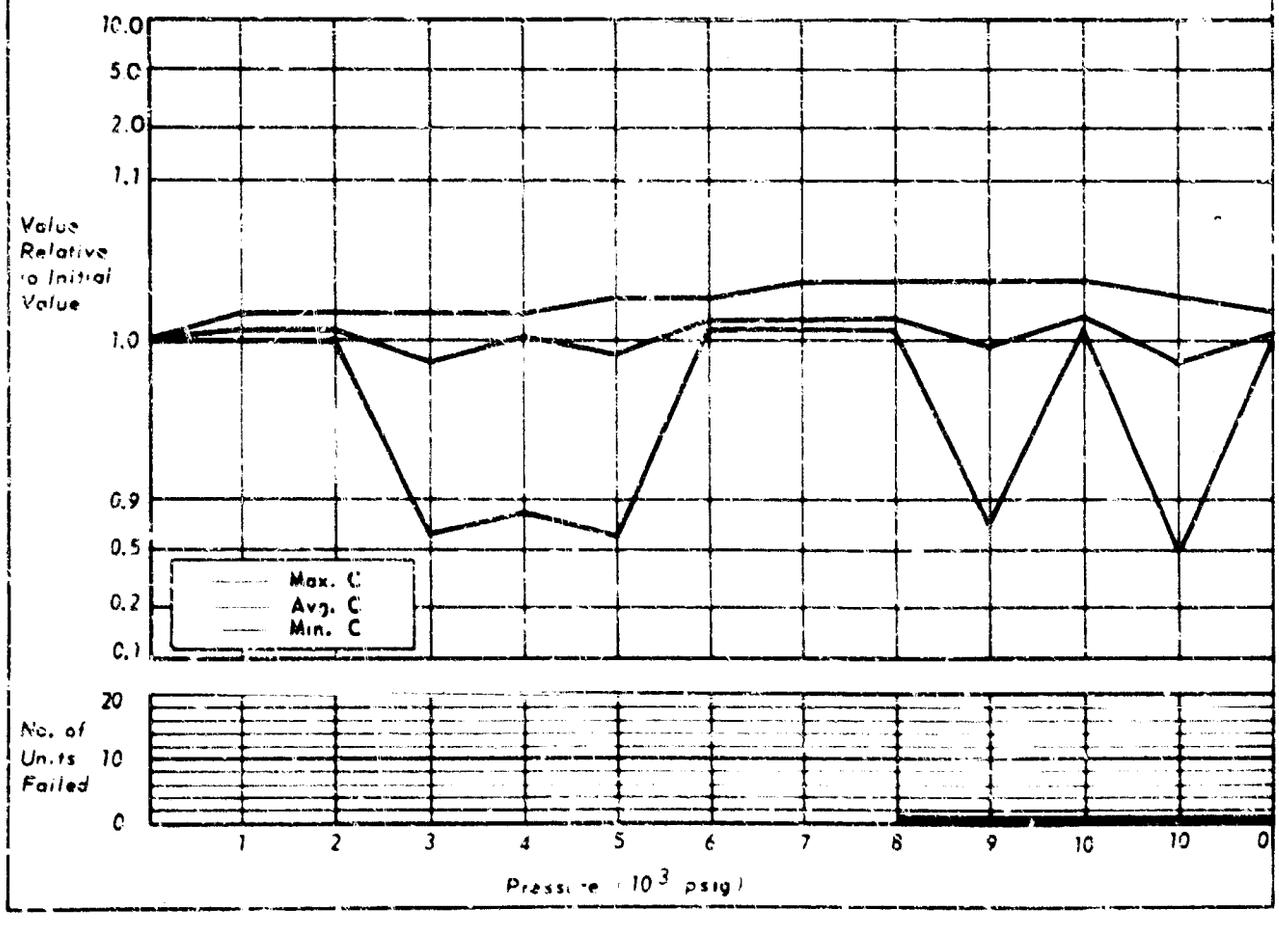
MFG. - CORNELL-DUBILIER
TYPE - CAPACITOR
DESCRIPTION - PKM 4P47

CHART NO. 23
NO. OF SAMPLES TESTED - 17




MFG. - CORNELL-DUBILIER
TYPE - CAPACITOR
DESCRIPTION - PKM 2W1

CHART NO. 24
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Cornell-Dubilier | 0.47 μF ± 20% | Solid impreg |
| PKM 4P47 | 400 VDCW | Tubular, axial lead |
| Capacitor | | Thermoset molded |
| | | 1.94 x 0.68" diam. |

SOAK PERIOD: None
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10%

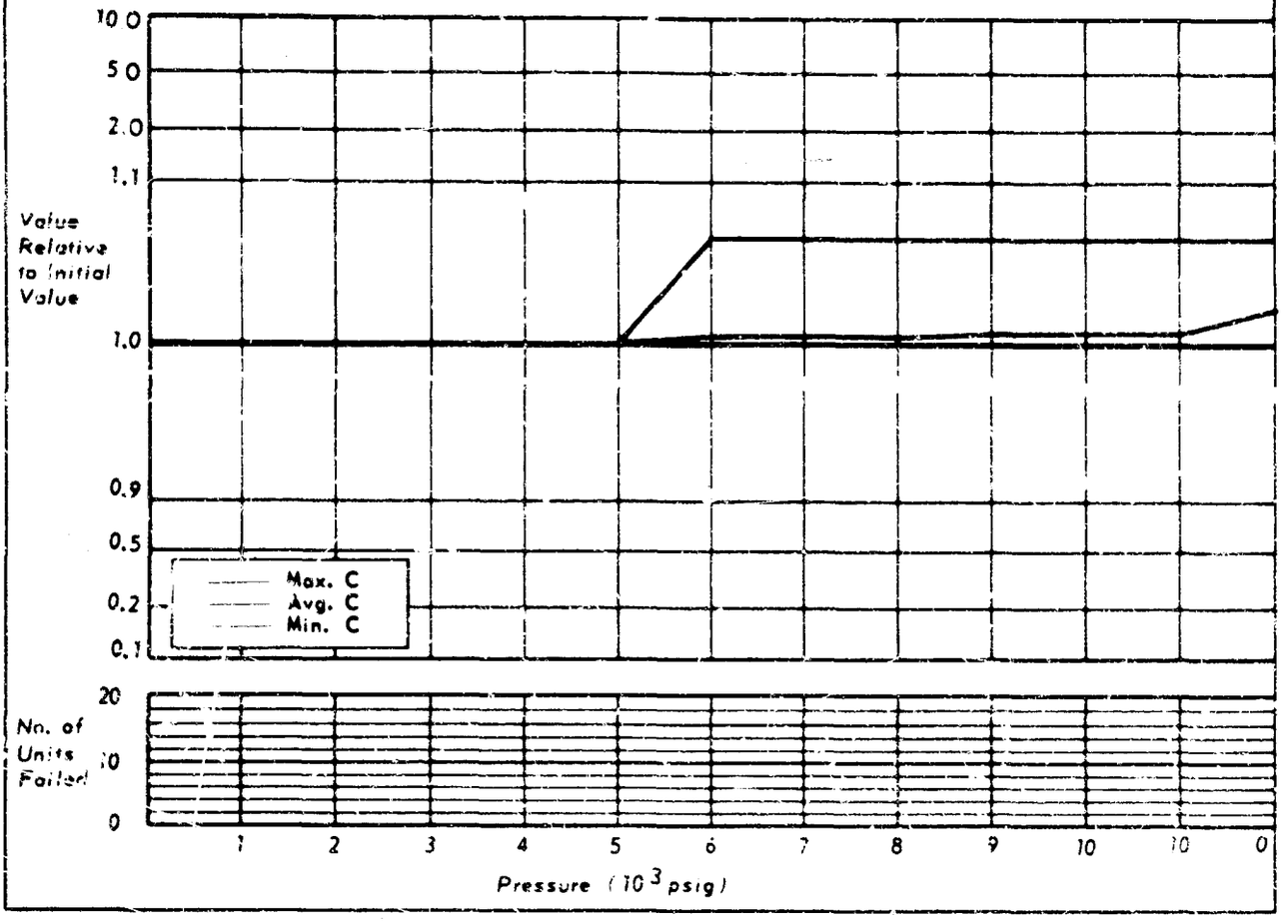
| | | |
|---|---|---|
| Cornell-Dubilier | 1.0 μF ± 10% | Solid Impreg |
| PKM 2W1 | 200 VDCW | Tubular, axial lead |
| Capacitor | | Thermoset molded |
| | | 2.125 x 1.0" diam. |

SOAK PERIOD: None
MECHANICAL: No apparent damage.
ELECTRICAL: Nineteen components indicated less than 10% change.

One component indicated a change greater than 50% with subsequent recovery at pressures shown on failure graph on opposite page. Recovery of the failing sample was on return to 0.

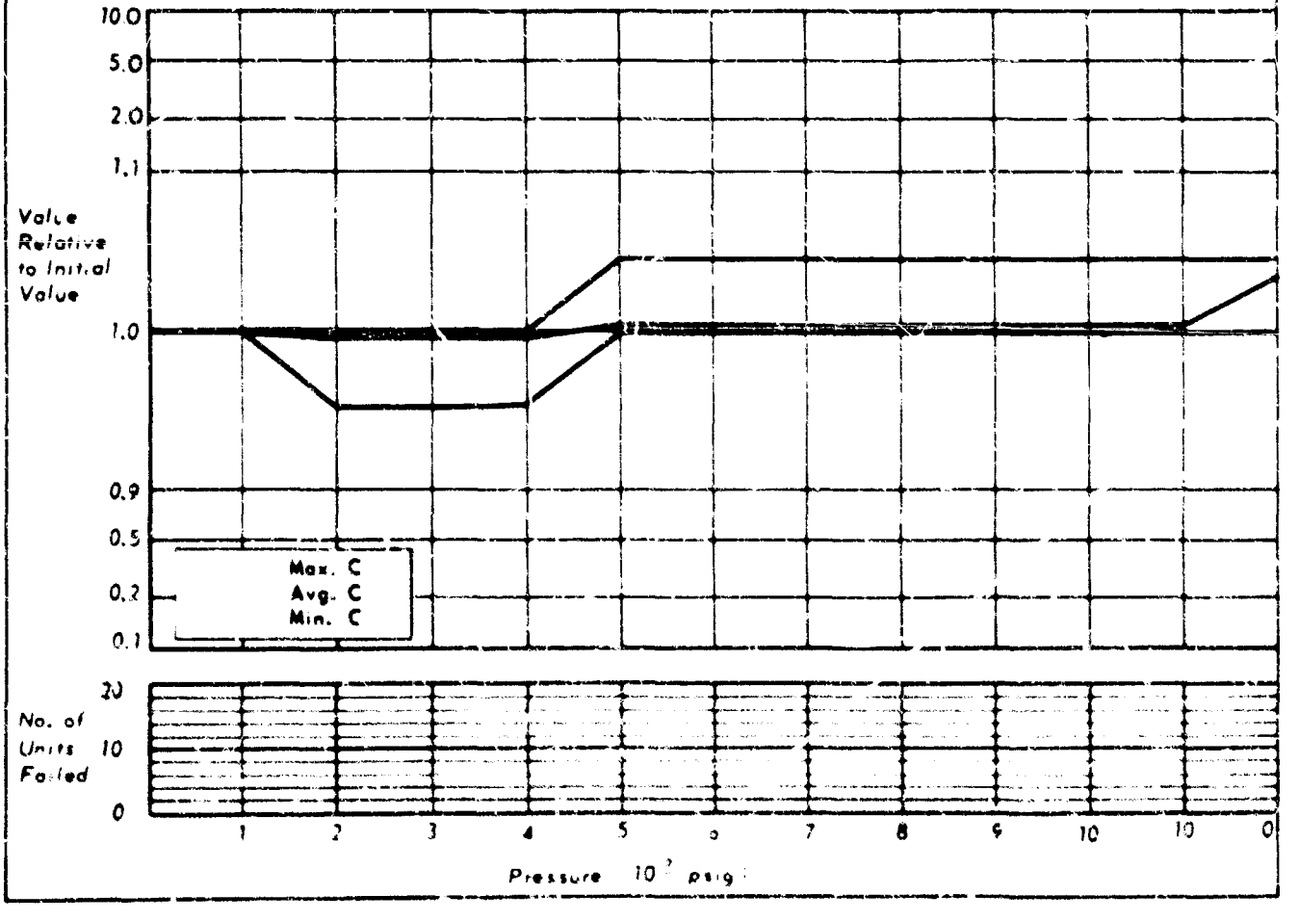
MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - JB .001M-V

CHART NO. 25
NO. OF SAMPLES TESTED - 20




MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - FGM602M

CHART NO. 26
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Cornell-Dubilier<br>JB<br>Capacitor | 0.001 $\mu$F ± 20%<br>Voltage as requested | Ceramic, disc<br>Florinated<br>Glass encap<br>0.437" diam x 0.15" th. |

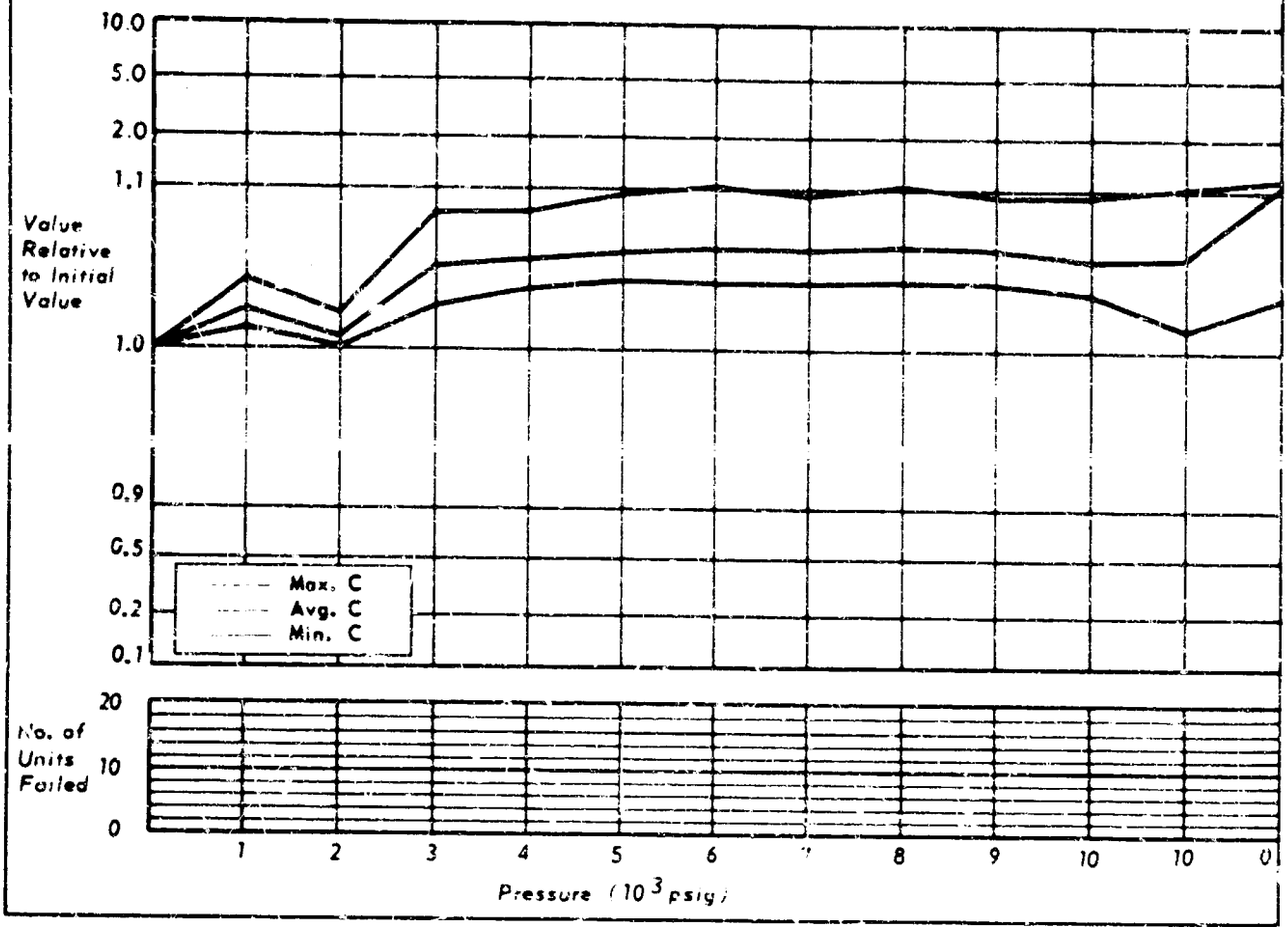
SOAK PERIOD: None
MECHANICAL: No apparent damage
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Cornell-Dubilier<br>FGH 6D2M<br>Capacitor | 0.002 $\mu$F ± 15%<br>500 VDCW | Ceramic, disc<br>Florinated<br>Glass encap<br>0.29 diam x 0.18" th. |

SOAK PERIOD: 16 hours at 10,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

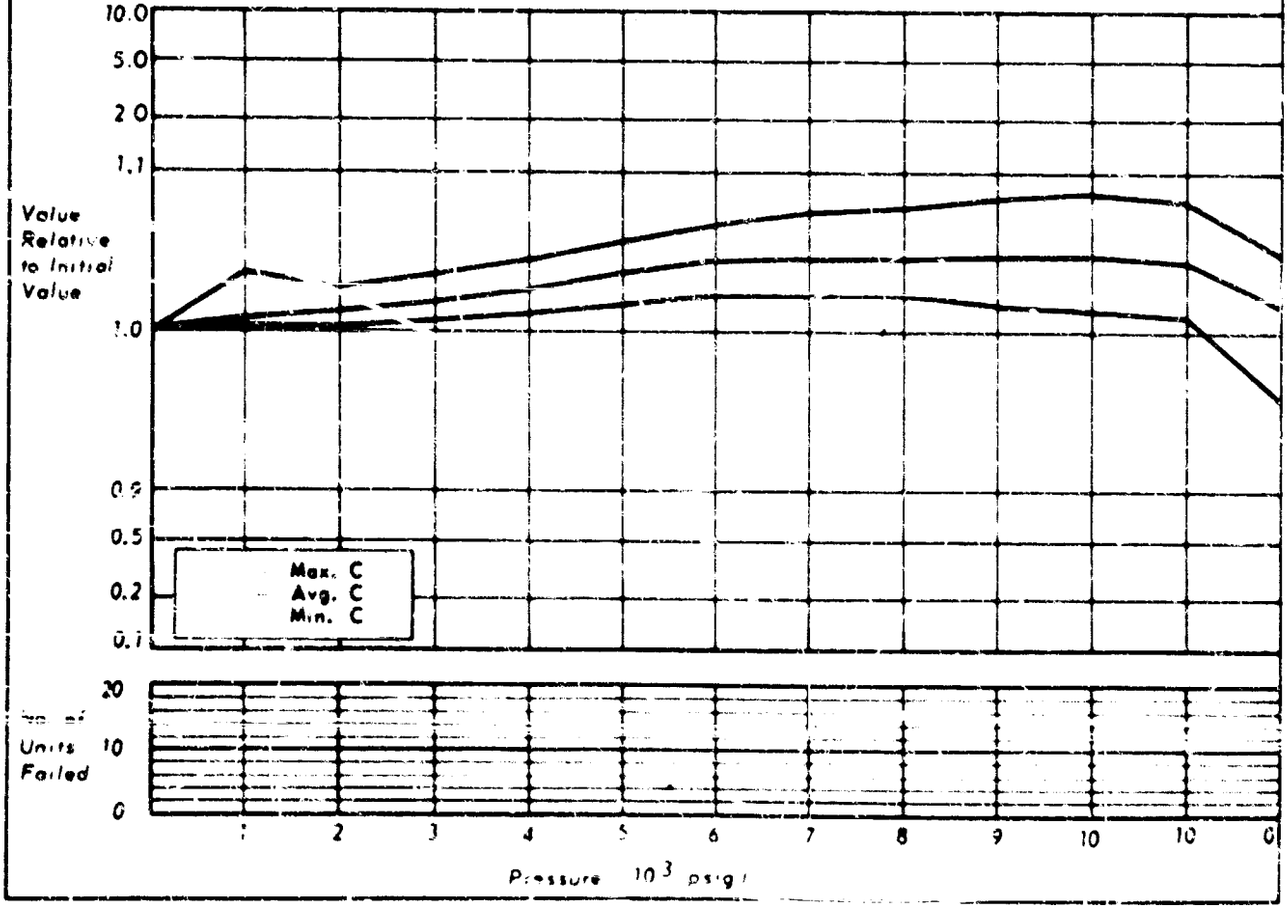
MFG. - CORNELL-DUBILIER
TYPE - CAPACITOR
DESCRIPTION - 5YA .01 6KV

CHART NO. 27
NO. OF SAMPLES TESTED - 19




MFG. - CORNELL-DUBILIER
TYPE - CAPACITOR
DESCRIPTION - NS .05/100V

CHART NO. 28
NO. OF SAMPLES TESTED - 19



| | | |
|---|---|---|
| Cornell-Dubilier | 0.01 μF GMV | Ceramic, disc |
| BYA 651 | 600 VDCW | Wax impreg |
| Capacitor | | Phenolic dip |
| | | 0.62 diam x 0.15" th. |

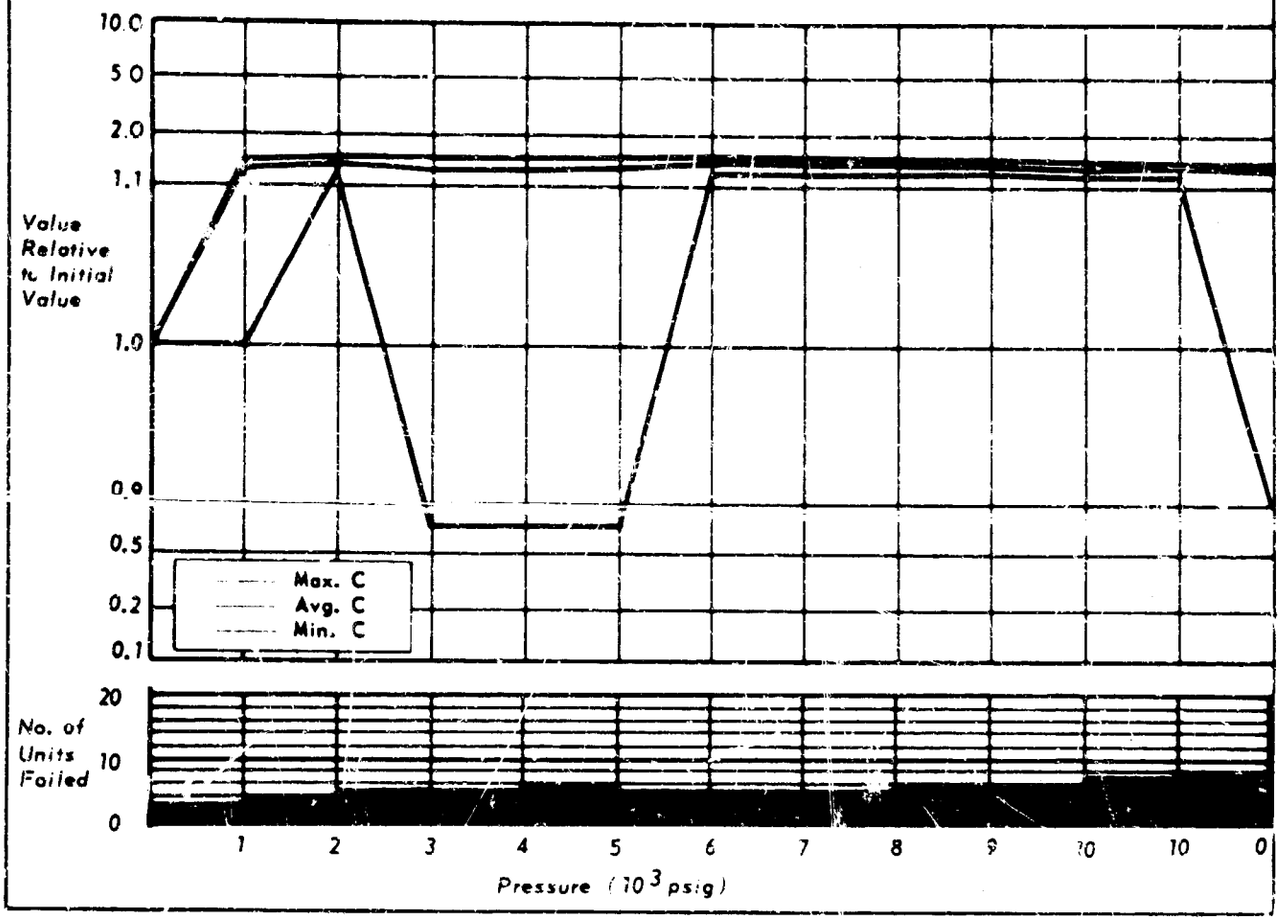
SOAK PERIOD: None
MECHANICAL: No apparent damage.
ELECTRICAL: Eighteen components indicated less than 10% change.
One component indicated a change greater than 10% and less than 50%.

| | | |
|---|---|---|
| Cornell-Dubilier | 0.05 μF $^{+80}_{-20}$ % | Ceramic disc |
| H5 | 100 VDCW | Wax impreg |
| Capacitor | | Phenolic dip |
| | | 0.625 diam x 0.125" th. |

SOAK PERIOD: None
MECHANICAL: No apparent damage
ELECTRICAL: All components indicated less than 10% change.

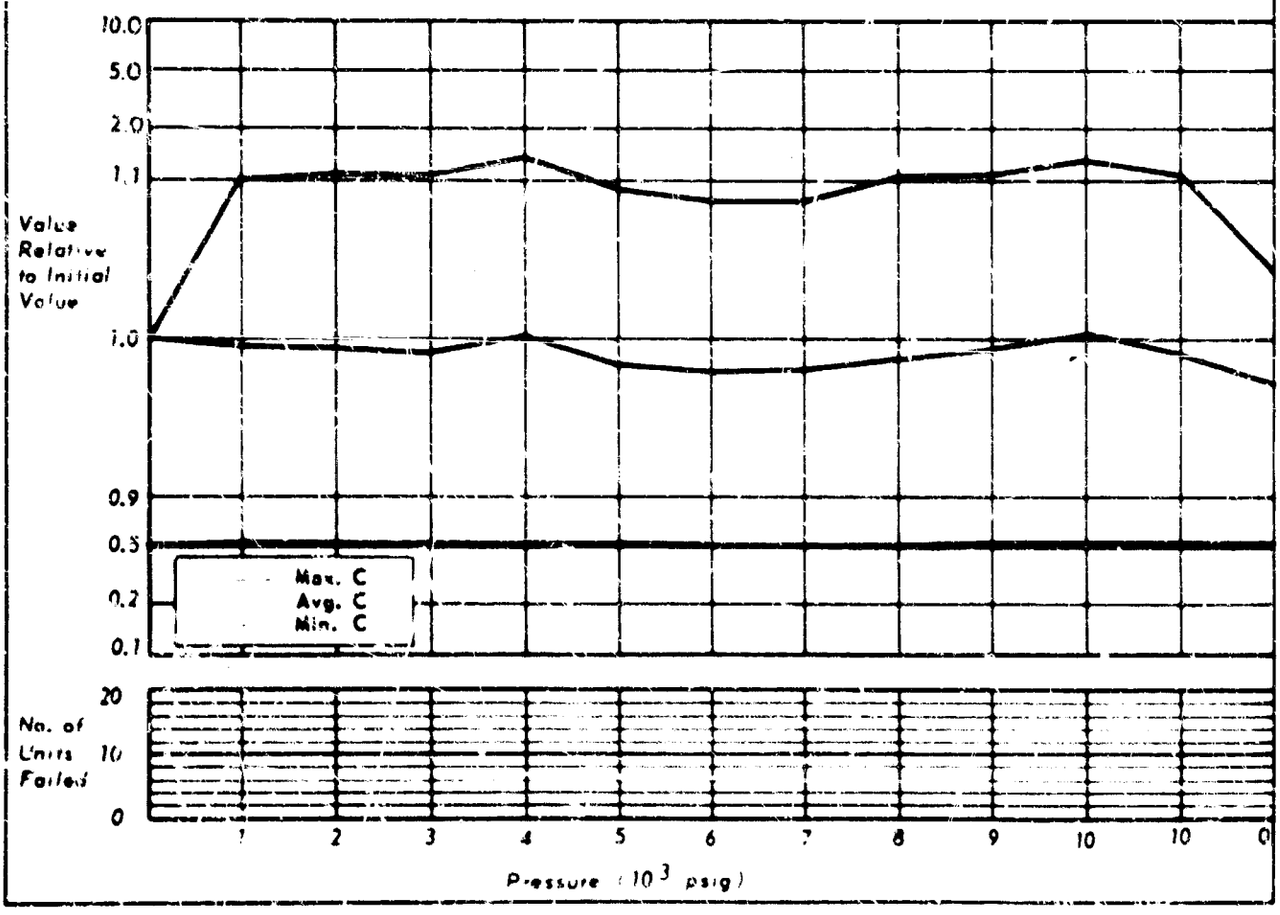
MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - BWH 5-180

CHART NO. 29
NO. OF SAMPLES TESTED - 18




MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - BWH 28-300

CHART NO. 30
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Cornell-Dubilier | 5.0 μF | Electrolytic |
| BWH 5-150 | 150 V | Tubular, axial lead |
| Capacitor | | 1.58 x 0.5" diam |

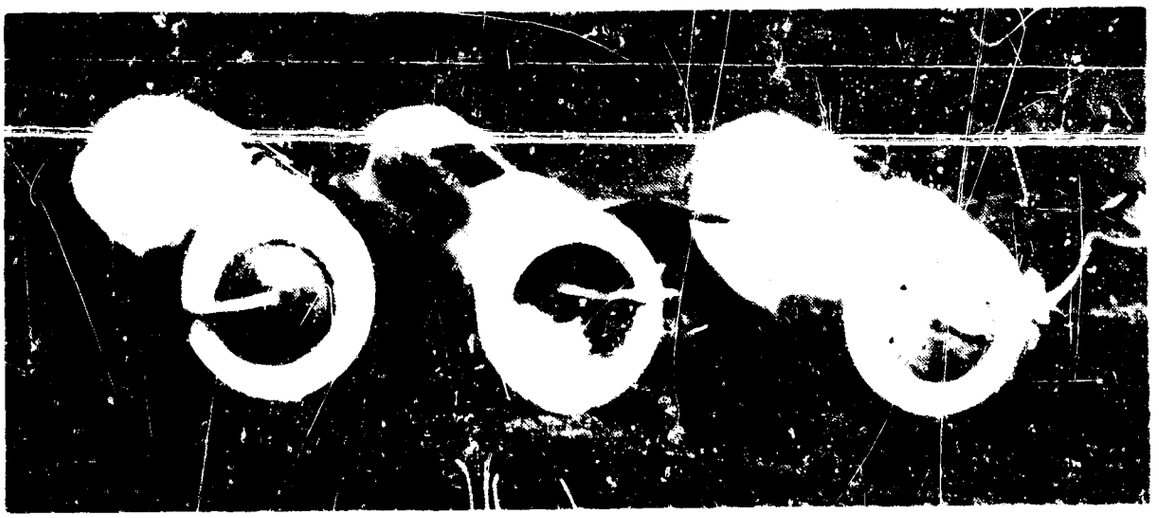
SOAK PERIOD: 15.5 hours at 10,000 psig.

MECHANICAL: Visual inspection after completion of test showed deformation of the metal casing and displacement of end seals on eighteen components.

ELECTRICAL: Ten components indicated a change greater than 10% and less than 50%.

Five components indicated a change greater than 50% with subsequent recovery at pressures shown on failure graph on opposite page.

FAILURES: Five components indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.

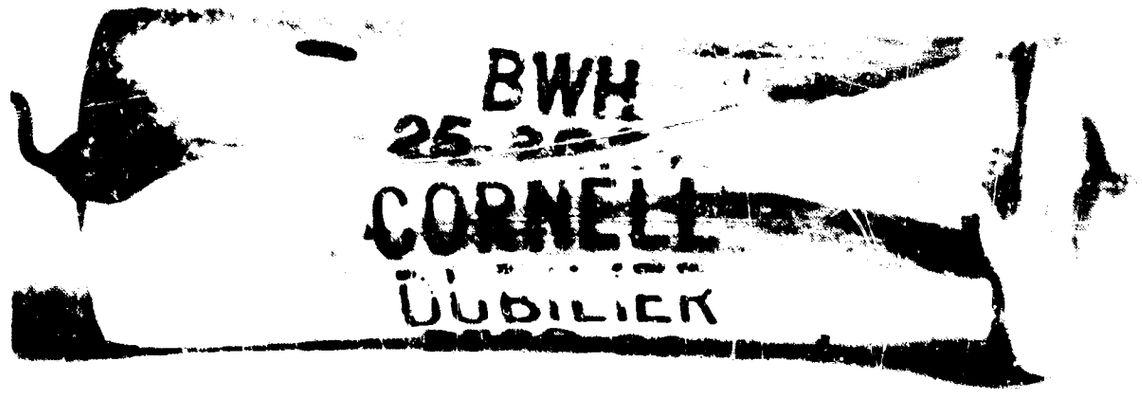


| | | |
|---|---|---|
| Cornell-Dubilier | 25.0 μF | Electrolytic |
| BWH 25-300 | 300 V | Tubular, axial lead |
| Capacitor | | Ultra purity foil |
| | | 2.125 x 0.75" diam |

SOAK PERIOD: None

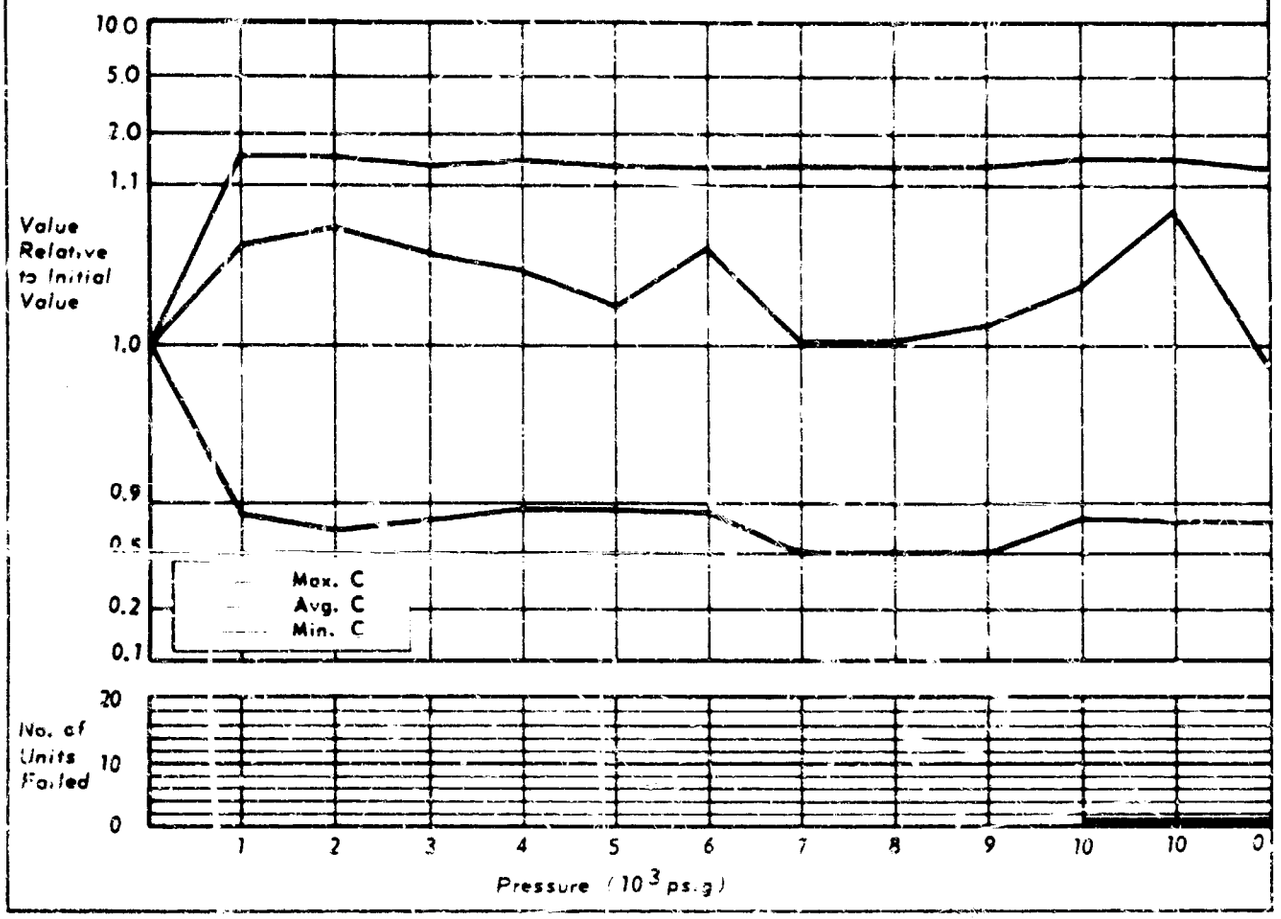
MECHANICAL: Visual inspection after completion of test showed slight deformation of all metal cases. One seal appeared ruptured as evidenced by an oil deposit in the external teflon case.

ELECTRICAL: All components indicated a change greater than 10% and less than 50%.



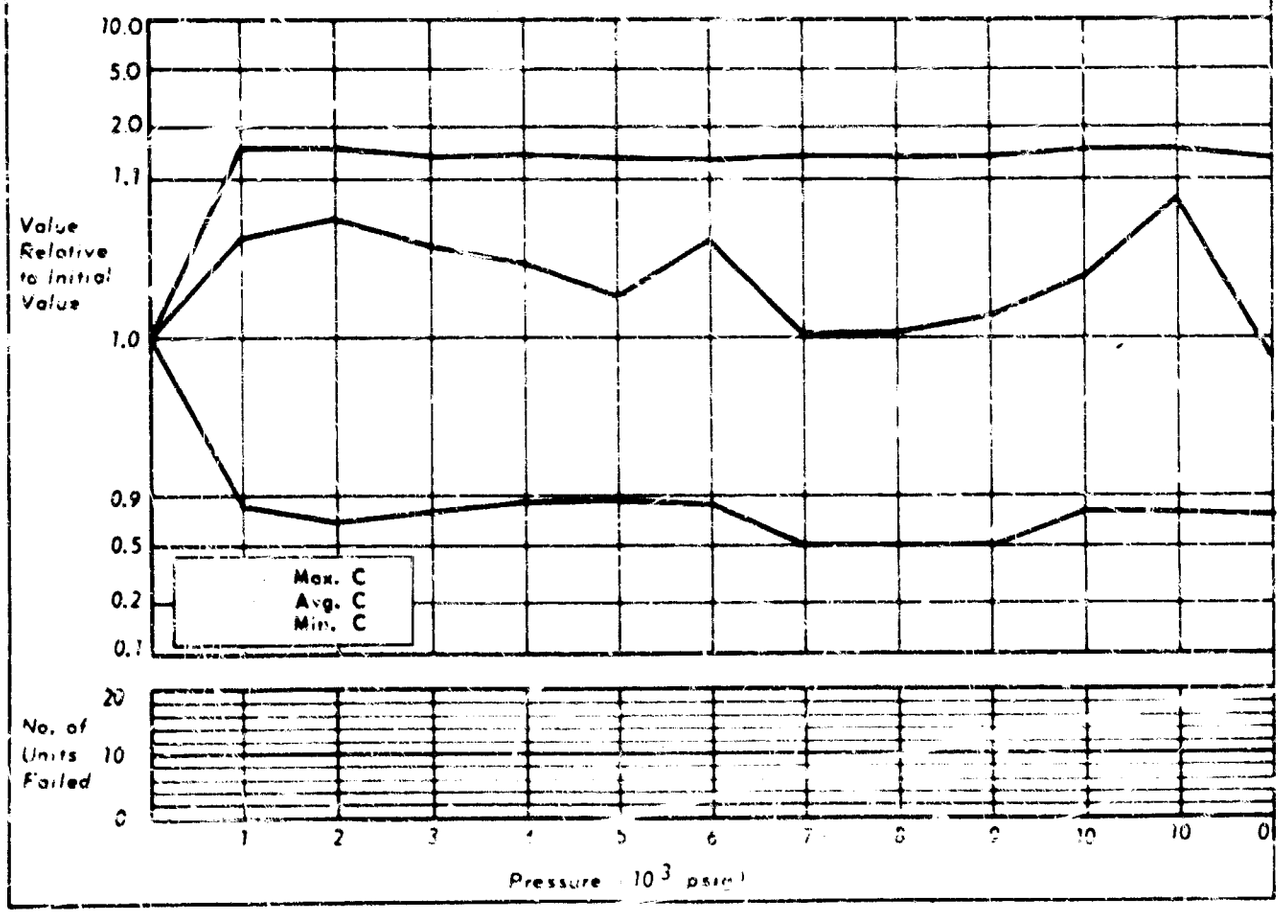
MFG. - CORNELL-DUBILIER
TYPE - CAPACITOR
DESCRIPTION - BWH 80-80

CHART NO. 31
NO. OF SAMPLES TESTED - 20




MFG. - CORNELL-DUBILIER
TYPE - CAPACITOR
DESCRIPTION - NLW 10-12

CHART NO. 32
NO. OF SAMPLES TESTED - 19



| | | |
|---|---|---|
| Cornell-Dubilier | 50.1 μF | Electrolytic |
| BWH 50-50 | 50 WV | Tubular, axial lead |
| Capacitor | | Aluminum foil |
| | | 1.62 x 0.62" diam |

**SOAK PERIOD:** 15.5 hours at 10,000 psig.

**MECHANICAL:** Visual inspection after completion of test showed slight deformation of three metal cases, end seal displacement of five samples, and insulation extrusion of two samples.

**ELECTRICAL:** Nine components indicated less than 10% change.

Ten components indicated a change greater than 10% and less than 50%.

**FAILURES:** One component indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.


| | | |
|---|---|---|
| Cornell-Dubilier | 10 μF $^{+15}_{-10}$ % | Electrolytic |
| NLW 10-12 | 12 V | Tubular, axial lead |
| Capacitor | | 1.58 x 0.5" diam |

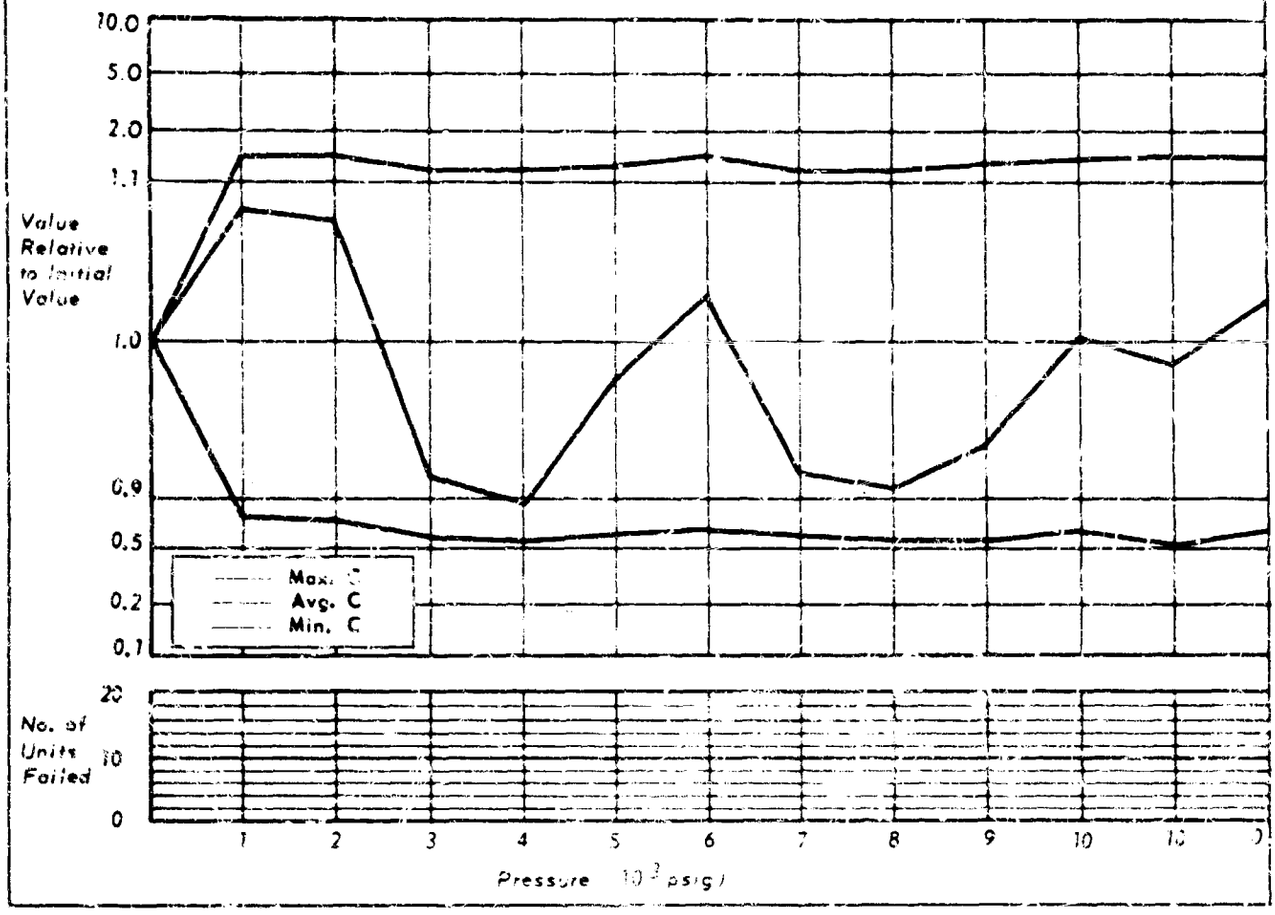
**SOAK PERIOD:** 16 hours at 3,000 psig.

**MECHANICAL:** No apparent damage.

**ELECTRICAL:** One component indicated a change greater than 10% and less than 50%. All other components had less than 10% change.

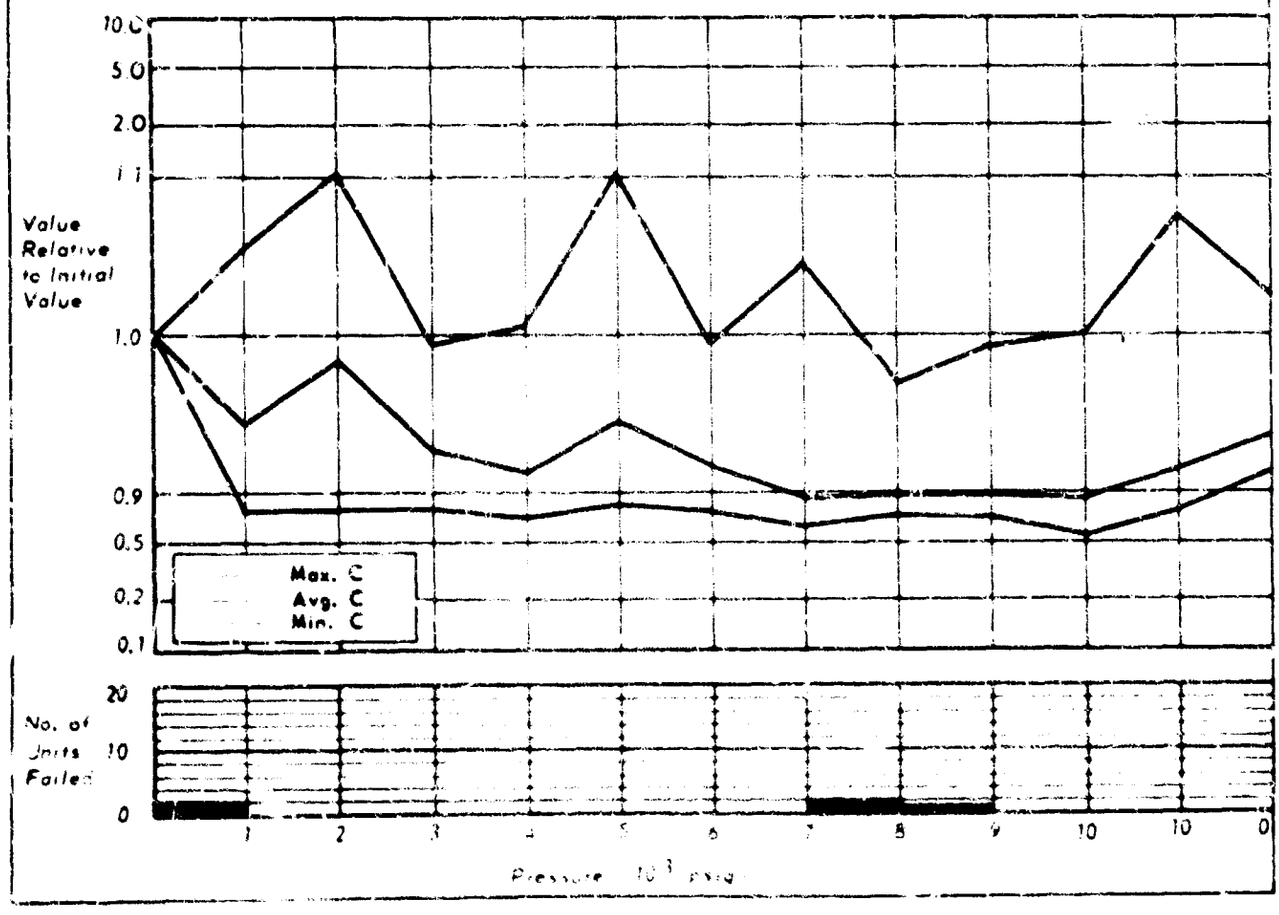
MFG.-CORNELL-DUBILIER
TYPE-CAPACITOR
DESCRIPTION-NLW-50-12

CHART NO. 33
NO. OF SAMPLES TESTED-20




MFG.-CORNELL-DUBILIER
TYPE-CAPACITOR
DESCRIPTION-NLW-55-50

CHART NO. 34
NO. OF SAMPLES TESTED-20



| | | |
|---|---|---|
| Cornell-Dubilier | 50.0 μF $^{+150}_{-10}$ % | Electrolytic |
| NLW 50-12 | 12 V | Tubular, axial lead |
| Capacitor | | Aluminum foil |
| | | 0.625 x 0.375" diam |

**SOAK PERIOD:** 16 hours at 3,000 psig.

**MECHANICAL:** No apparent damage

**ELECTRICAL:** Ten components indicated less than 10% change.

Ten components indicated a change greater than 10% and less than 50%.

| | | |
|---|---|---|
| Cornell-Dubilier | 85.0 μF | Electrolytic |
| NLW 85-50 | 50 WV | Tubular, axial lead |
| Capacitor | | Aluminum foil |
| | | 1.5 x 0.375" diam. |

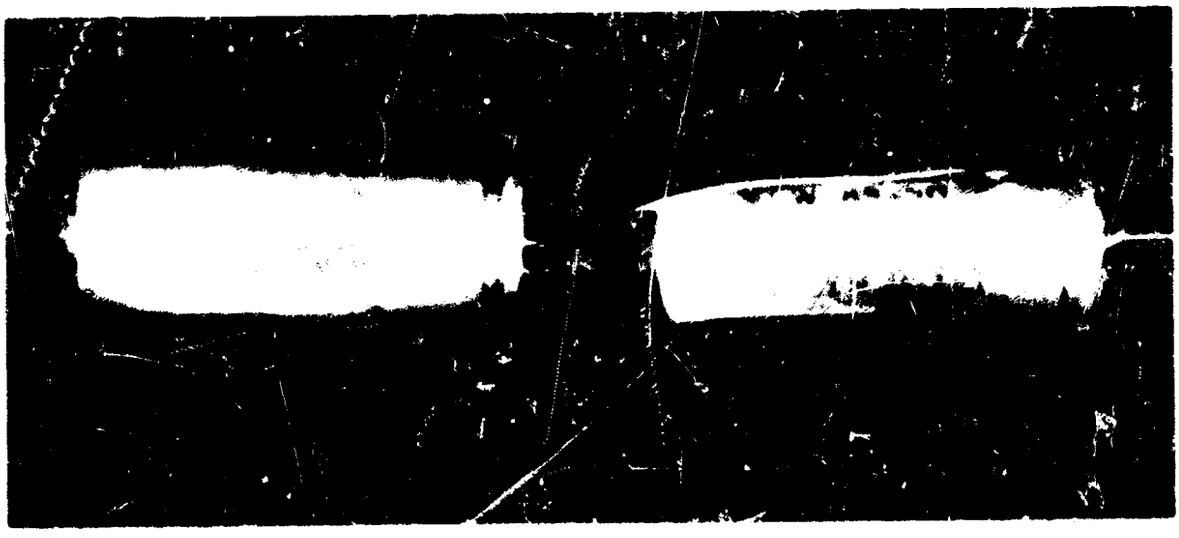
**SOAK PERIOD:** 16 hours at 3,000 psig.

**MECHANICAL:** Visual inspection following completion of tests showed slight deformation of the metal cases of nine components. Seven of the damaged components remained functional throughout the entire test.

**ELECTRICAL:** Eleven components indicated less than 10% change.

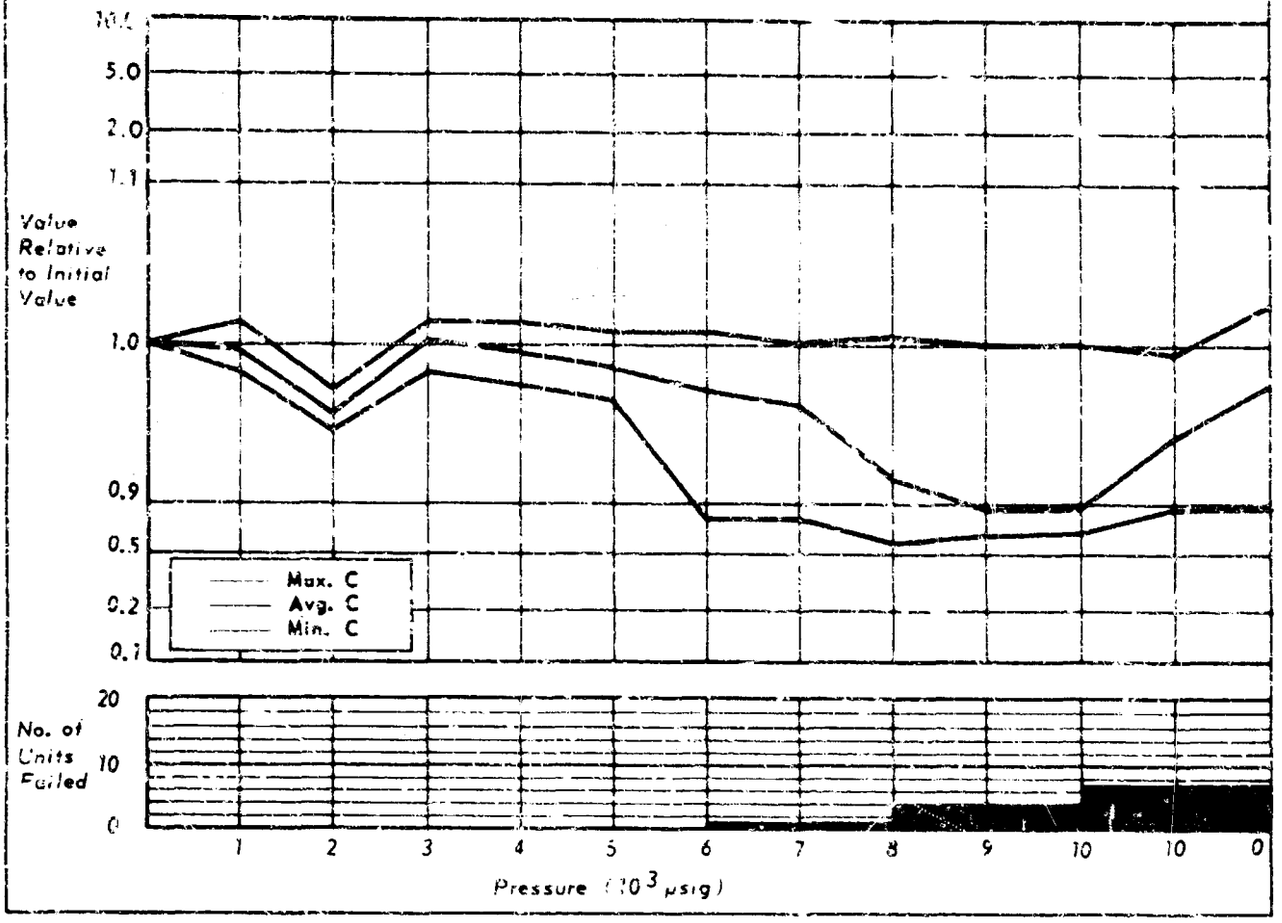
Seven components indicated a change greater than 10% and less than 50%.

Two components indicated a change greater than 50% with subsequent recovery at pressures shown on failure graph on opposite page.



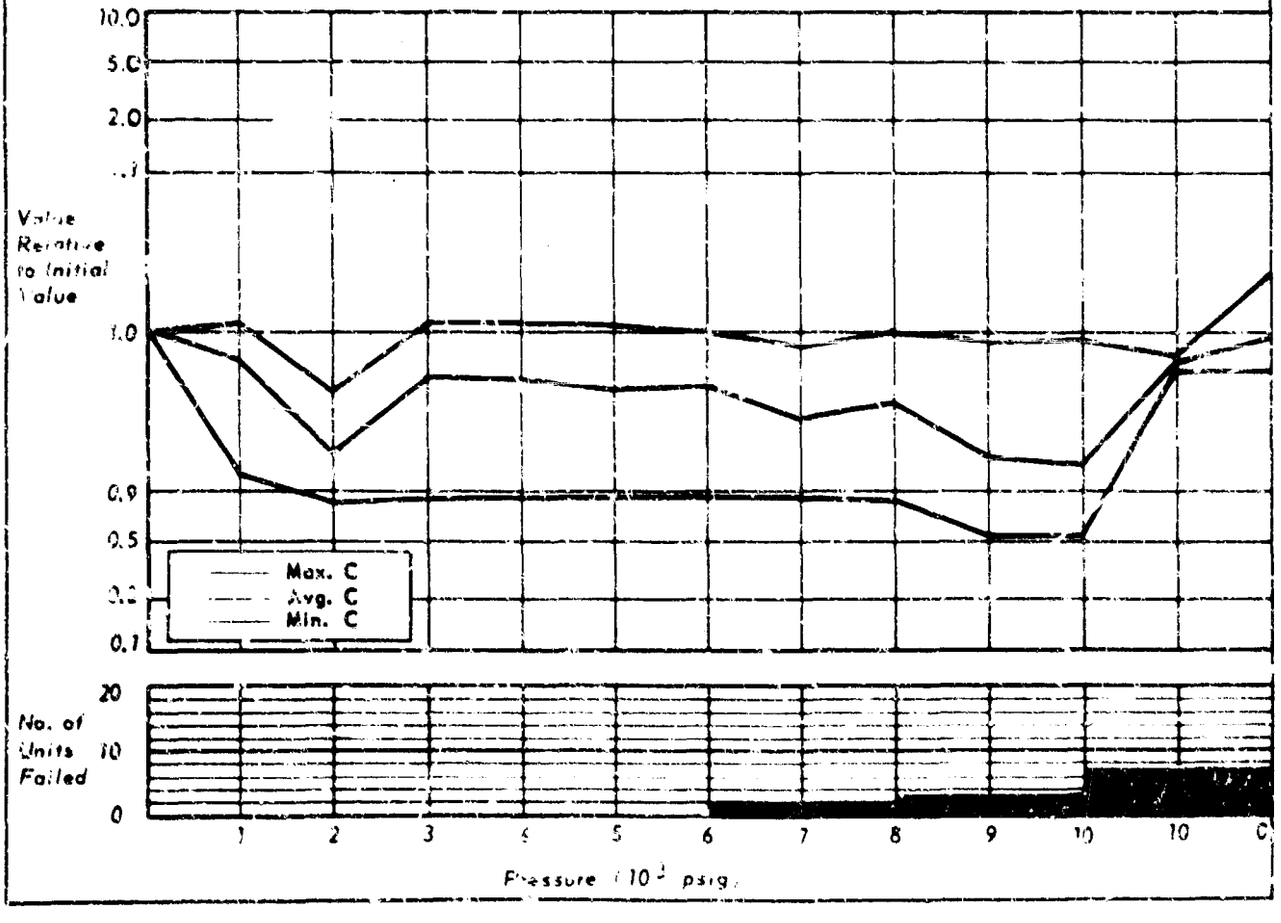
MFG. - CORNELL-DUBILIER
TYPE - CAPACITOR
DESCRIPTION - CK06, .0018 μF

CHART NO. 35
NO. OF SAMPLES TESTED - 10




MFG. - CORNELL-DUBILIER
TYPE - CAPACITOR
DESCRIPTION - CK06, .0022 μF

CHART NO. 36
NO. OF SAMPLES TESTED - 10



| | | |
|---|---|---|
| Cornell-Dubilier | 0.0018 μF ± 10% | Ceramic |
| CK06 | 200 VDCW | Phenolic case |
| Capacitor | | Square, radial lead |
| | | 0.3 x 0.03 x 0.1" th. |

**SOAK PERIOD:** 15.5 hours at 10,000 psig.

**MECHANICAL:** No apparent damage.

**ELECTRICAL:** Two components indicated less than 10% change.

One component indicated a change greater than 10% and less than 50%.

**FAILURES:** Six components indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.

| | | |
|---|---|---|
| Cornell-Dubilier | 0.0022 μF ± 10% | Ceramic |
| CK06 | 200 VDCW | Phenolic case |
| Capacitor | | Square, radial lead |
| | | 0.3 x 0.3 x 0.1" th. |

**SOAK PERIOD:** 15.5 hours at 10,000 psig.

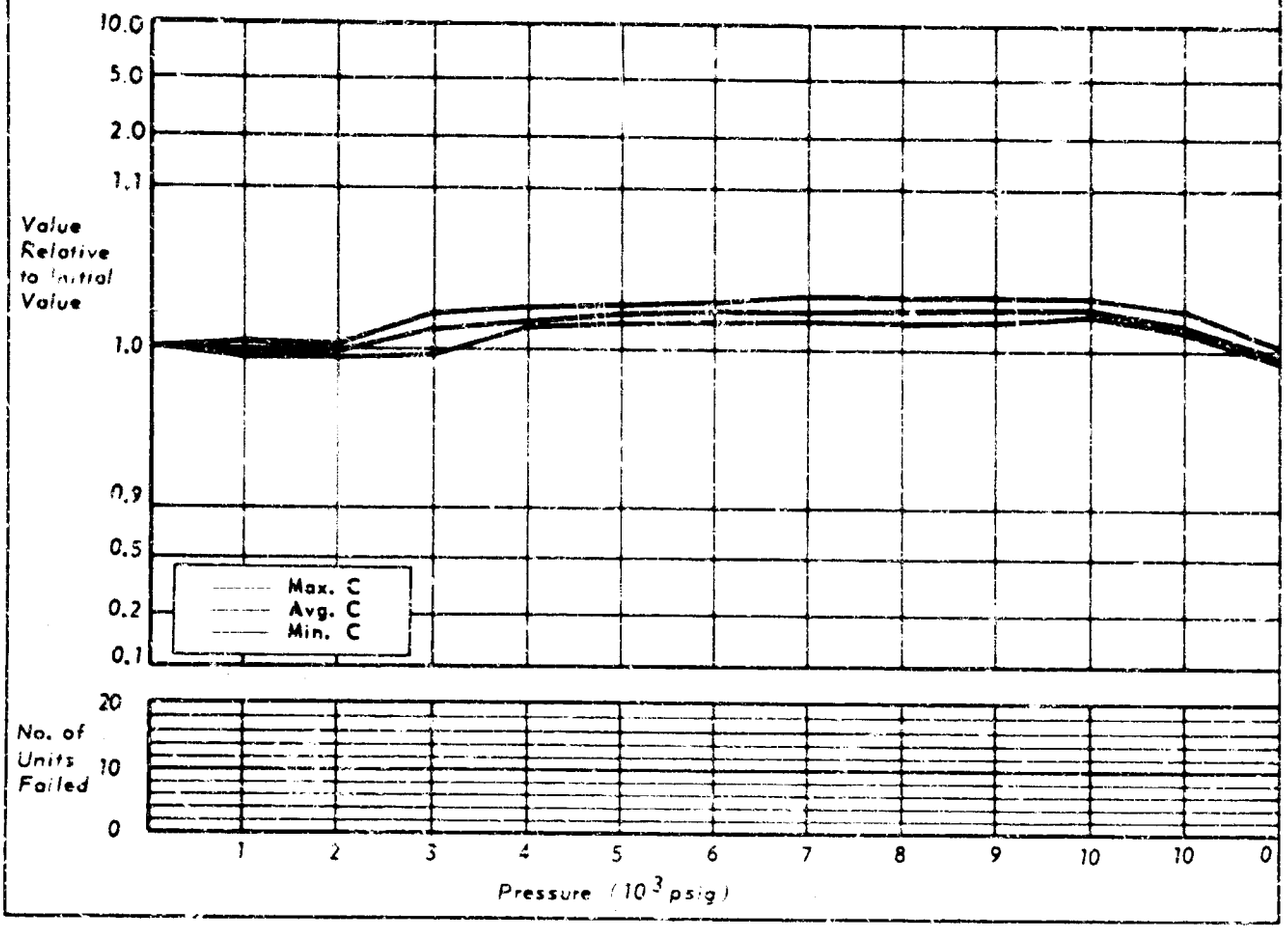
**MECHANICAL:** No apparent damage.

**ELECTRICAL:** Three components indicated less than 10% change.

**FAILURES:** Seven components indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.

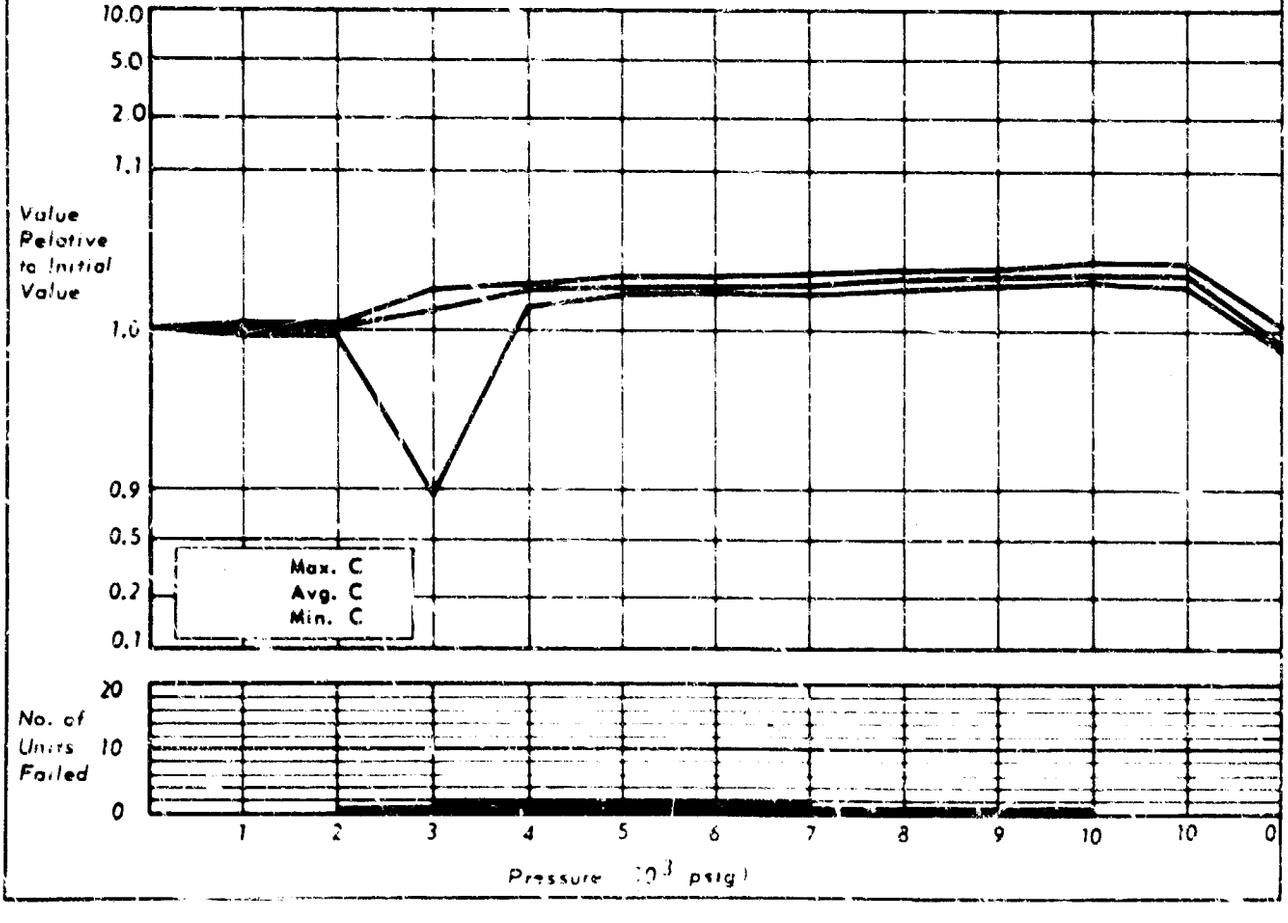
MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - MTYXN1C6#3M

CHART NO. 37
NO. OF SAMPLES TESTED - 19




MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - MTYN1A104M

CHART NO. 38
NO. OF SAMPLES TESTED - 19

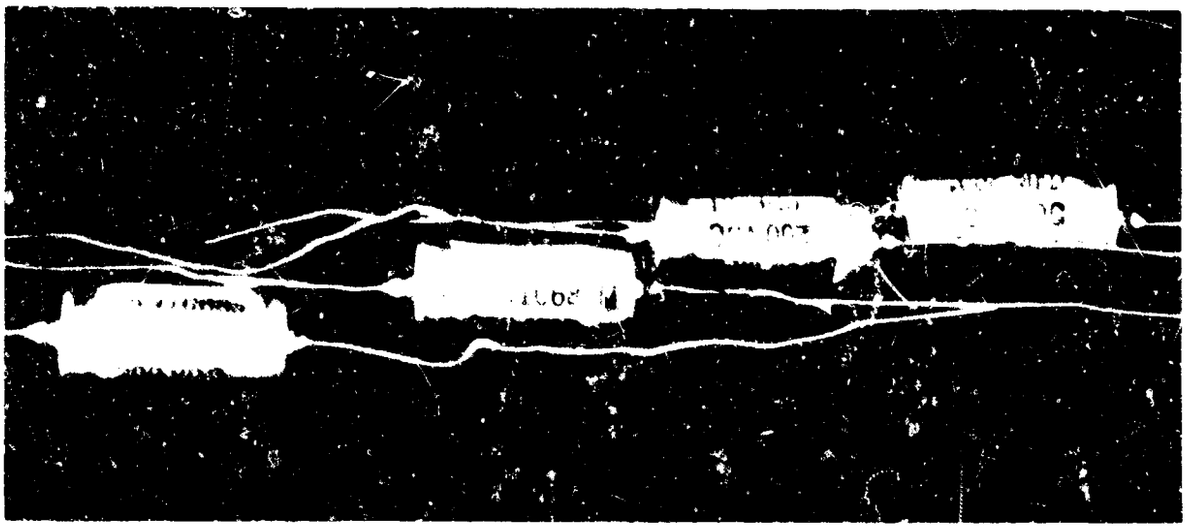


| | | |
|---|---|---|
| Cornell-Dubilier | 0.068 μF ± 20% | Metalized paper, film |
| MTYKNIC 683M | 200 VDCW | Tubular, axial lead |
| Capacitor | | Glass end seal |
| | | 1.125 x 0.5" diam |

**SOAK PERIOD:** 16 hours at 10,000 psig.

**MECHANICAL:** Visual inspection following completion of tests showed slight deformation of the metal cases of all components. All damaged components remained functional throughout the entire test.

**ELECTRICAL:** All components indicated less than 10% change.



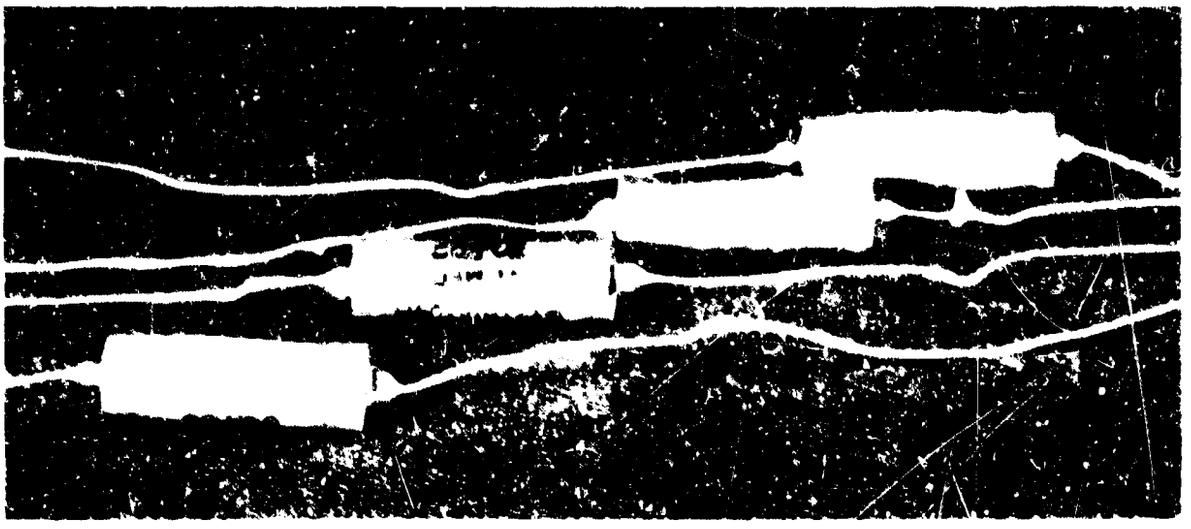
| | | |
|---|---|---|
| Cornell-Dubilier | 0.10 μF ± 20% | Metalized paper, film |
| MTYTNIA104M | 200 VDCW | Tubular, axial lead |
| Capacitor | | Glass end seal |
| | | 0.375 x 0.312" diam |

**SOAK PERIOD:** None

**MECHANICAL:** Visual inspection following completion of tests showed deformation of metal cases of all components. Seventeen of the damaged components remained functional throughout the entire test.

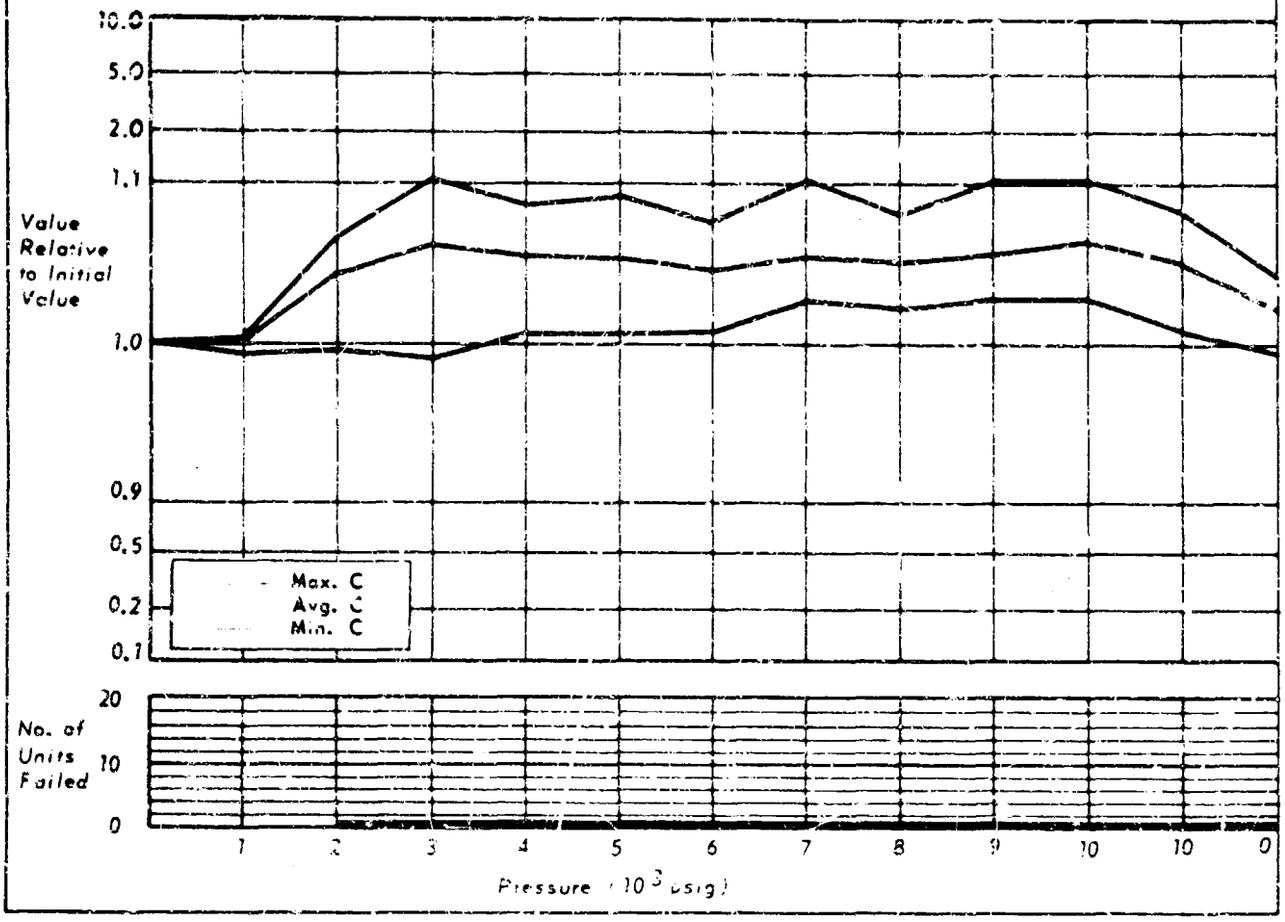
**ELECTRICAL:** Seventeen components indicated less than 10% change.

Two components indicated a change greater than 50% with subsequent recovery at pressures shown on failure graph on opposite page.



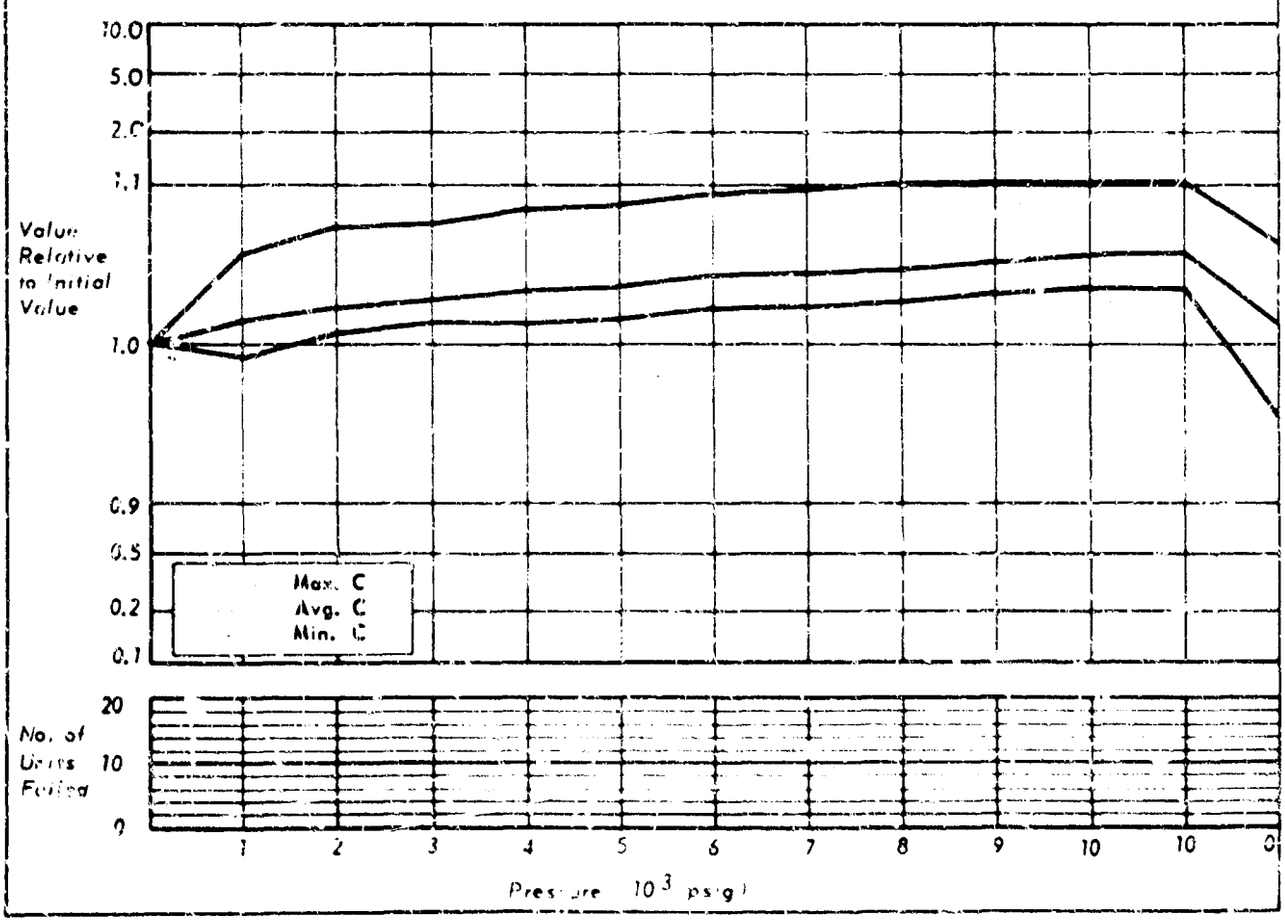
MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - MTWKNIC104N

CHART NO. 39
NO. OF SAMPLES TESTED - 19




MFG. - CORNELL - DUBILIER
TYPE - CAPACITOR
DESCRIPTION - CP05A1KB224K3

CHART NO. 40
NO. OF SAMPLES TESTED - 19



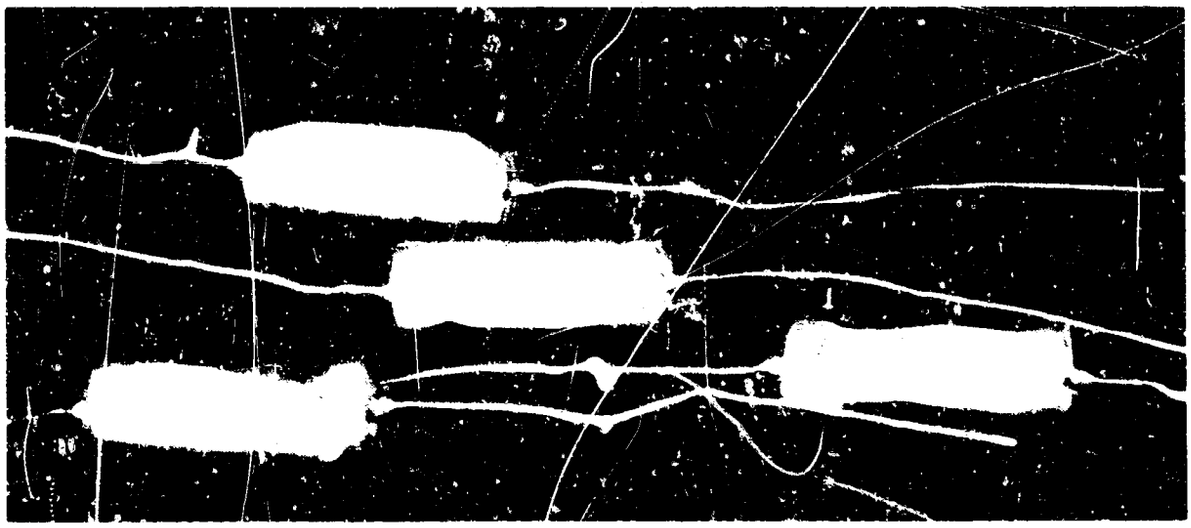
| | | |
|---|---|---|
| Cornell-Dubilier | 0.10 μF ± 20% | Metalized paper, film |
| MTWKNIC104M | 200 VDCW | Tubular, axial lead |
| Capacitor | | Glass end seal |
| | | 0.87 x 0.312" diam |

SOAK PERIOD: None

MECHANICAL: Visual inspection following completion of tests showed deformation of the metal cases of all components. Eighteen of the damaged components remained functional throughout the entire test.

ELECTRICAL: Eighteen components indicated less than 10% change.

FAILURES: One component indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.

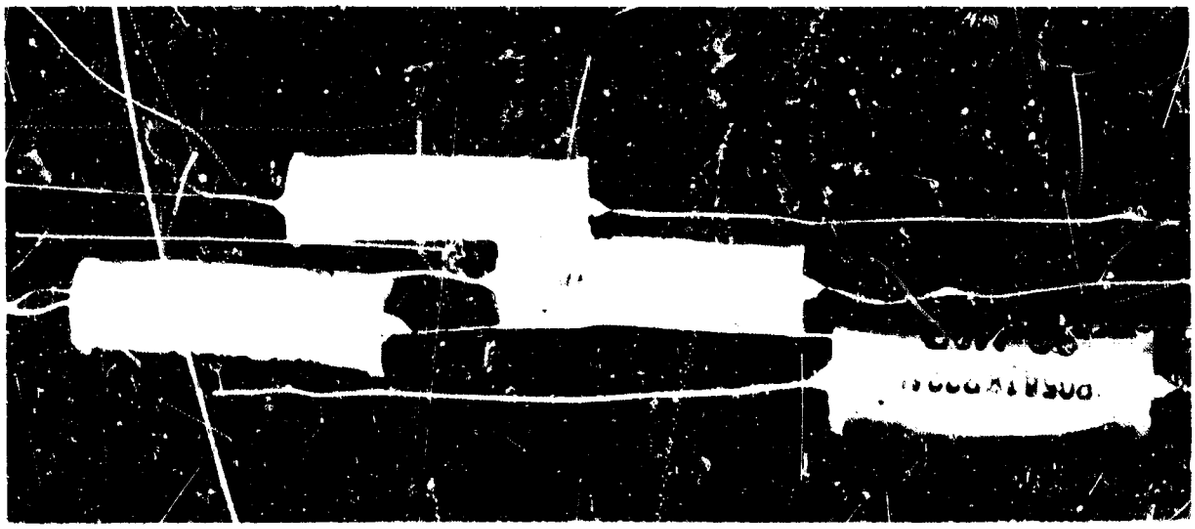


| | | |
|---|---|---|
| Cornell-Dubilier | 0.22 μF | Paper, oil |
| CP05AIKB224 3 | 100 VDCW | Tubular, axial lead |
| Capacitor | | Metal case |
| | | 1.125 x 0.4[illegible] diam |

SOAK PERIOD: None

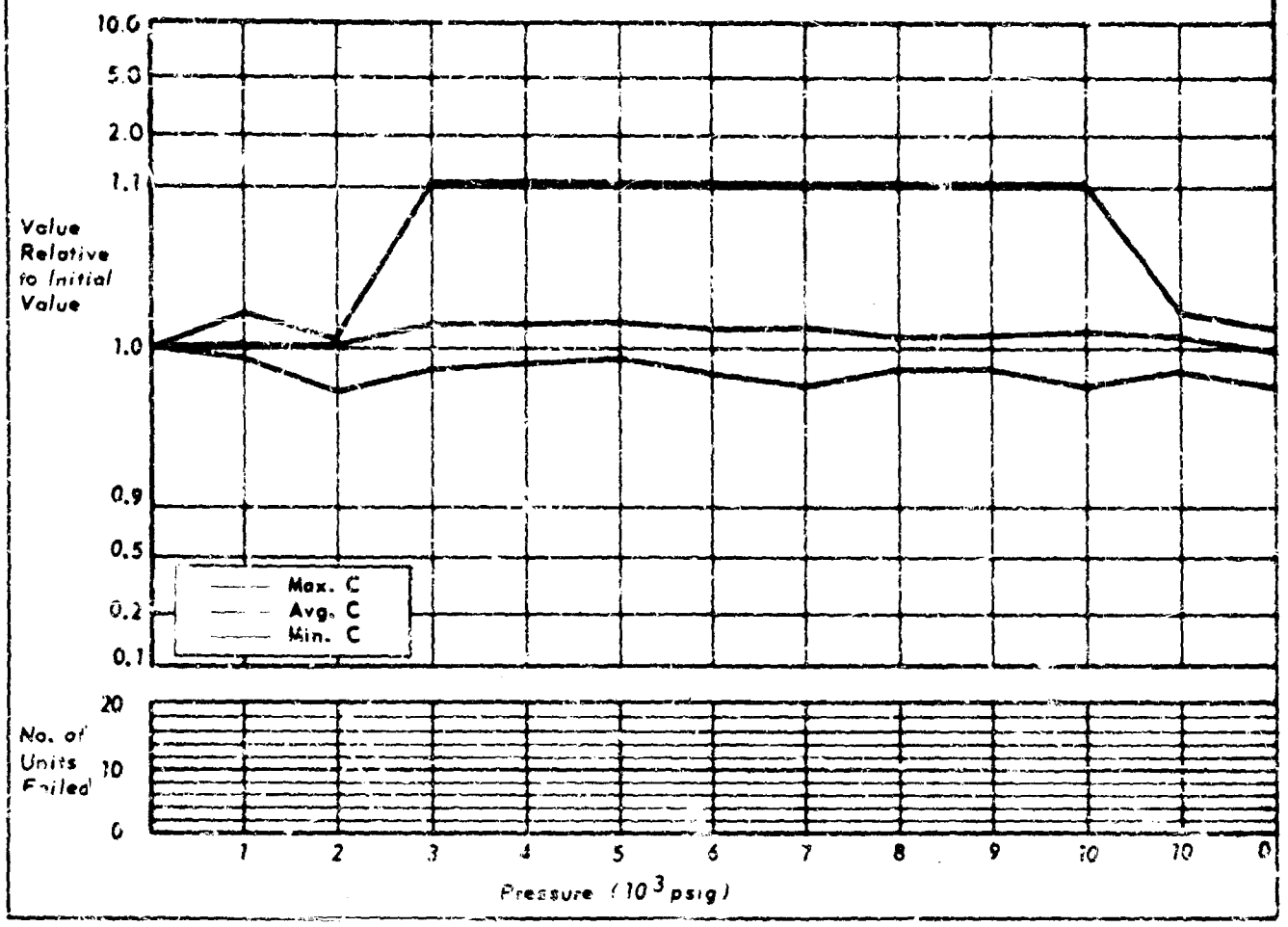
MECHANICAL: Visual inspection following completion of tests showed deformation of the metal cases of all components. All damaged components remained functional throughout the entire test.

ELECTRICAL: All components indicated less than 10% change.



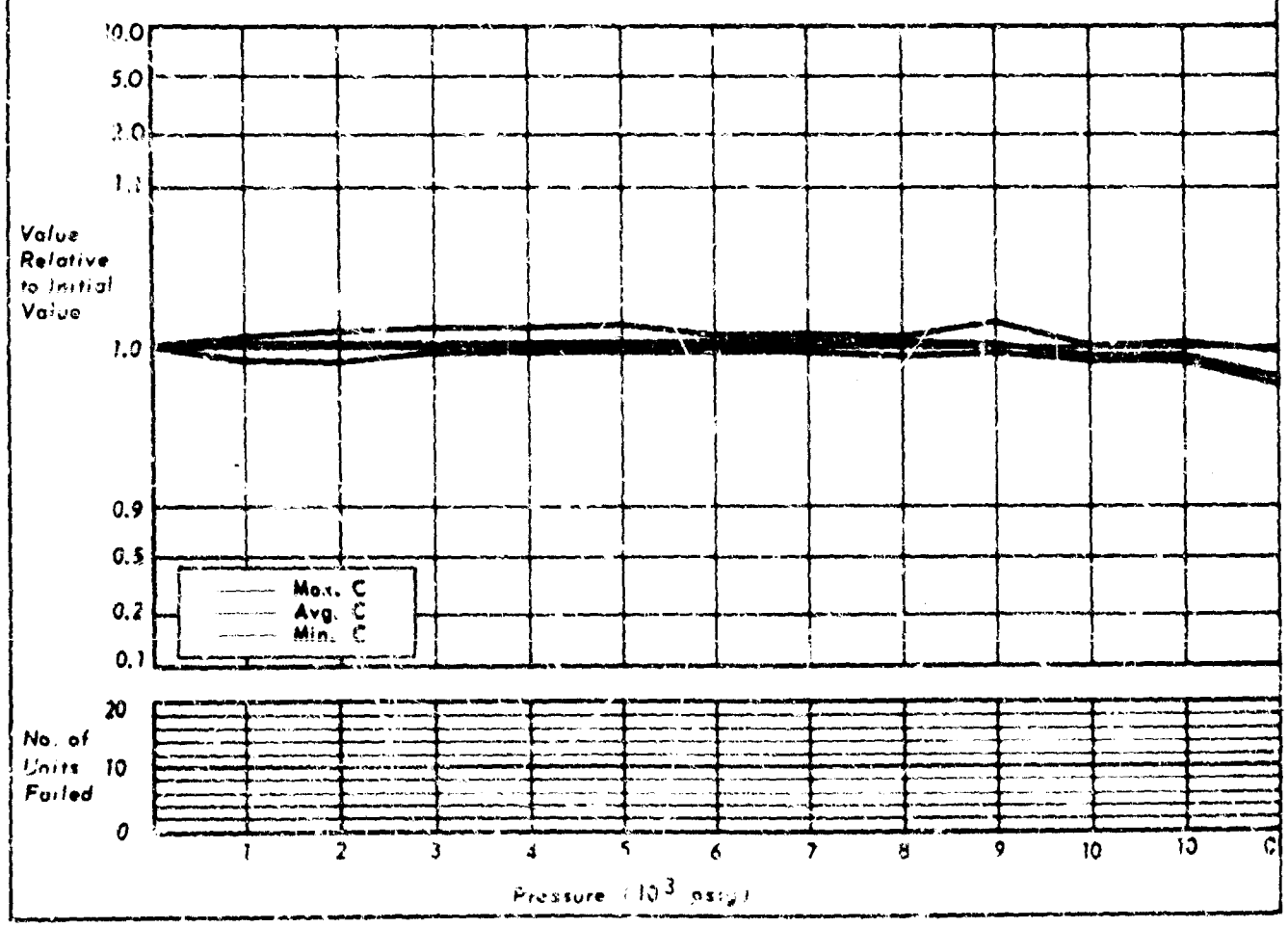
MFG.-CORNELL-DUBILIER
TYPE-CAPACITOR
DESCRIPTION-TYR128F82K

CHART NO. 41
NO. OF SAMPLES TESTED-20




MFG.-CORNELL-DUBILIER
TYPE-CAPACITOR
DESCRIPTION-CD18F391J

CHART NO. 42
NO. OF SAMPLES TESTED-20



| | | |
|---|---|---|
| Cornell-Dubilier | 0.82 μF | Solid tantalum |
| TYR2B8F82K | 35 VDCW | Tubular, axial lead |
| Capacitor | | 0.438 x 0.175" diam. |

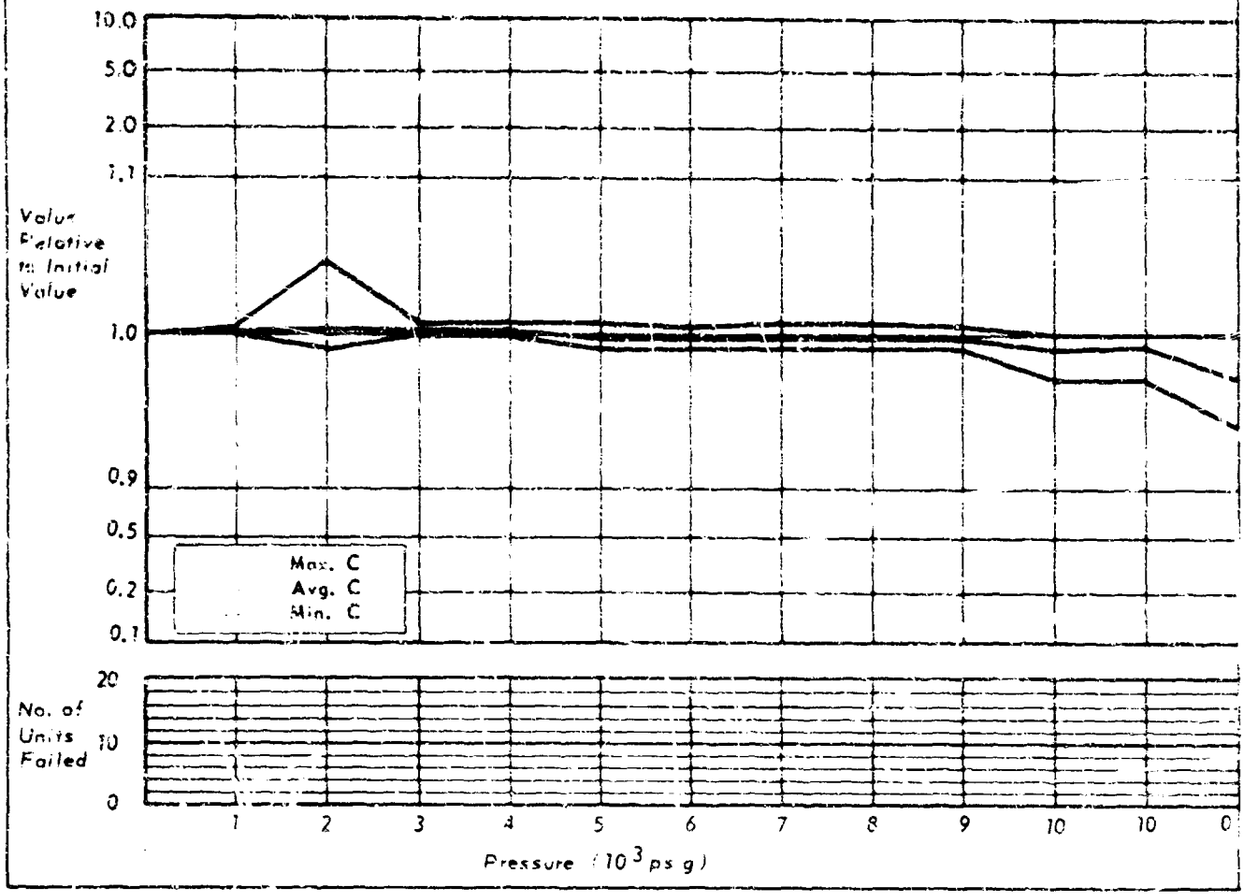
SOAK PERIOD: None
MECHANICAL: No apparent damage
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Cornell-Dubilier | 390 pF ± 5% | Mica, dipped |
| CD15F391J | 500 VDCW | Rectangular |
| Capacitor | | Radial lead |
| | | 0.47 x 0.4 x 0.22" th. |

SOAK PERIOD: 15.5 hours at 10,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

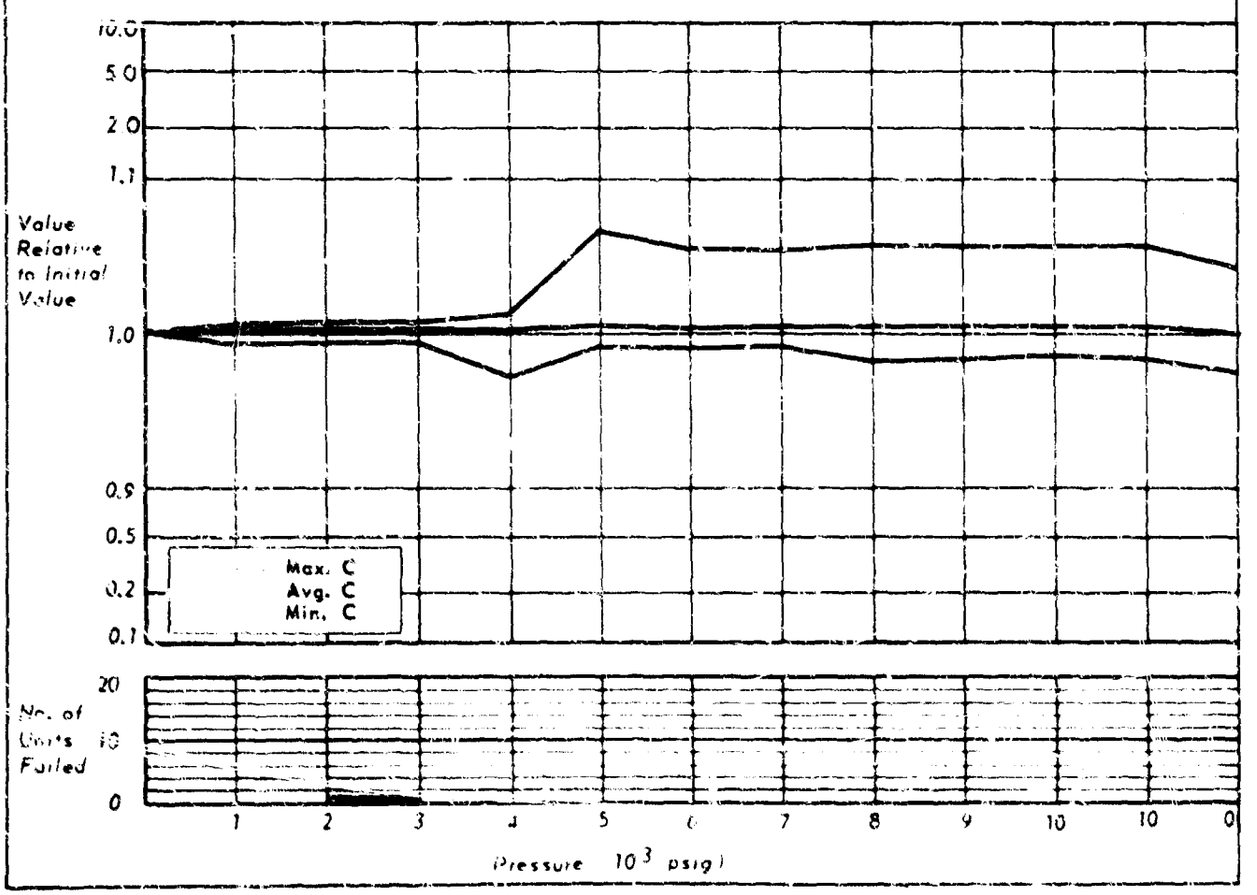
MFG. - CORNELL-DUBILIER
TYPE - CAPACITOR
DESCRIPTION - 2030F103J

CHART NO. 43
NO. OF SAMPLES TESTED - 19




MFG. - CORNELL DUBILIER
TYPE - CAPACITOR
DESCRIPTION - HCC3224P

CHART NO. 44
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Cornell-Dubilier | 0.01 $\mu$F ± 5% | Mica, dipped |
| CD30F103J | 300 VDCW | Rectangular |
| Capacitor | | Radial lead |
| | | 0.8 x 0.89 x 0.34" th. |

SOAK PERIOD: 16 hours at 10 000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Cornell-Dubilier | 0.22 $\mu$F | Ceramic, tear drop |
| HCC3224P | 3 VDCW | Phenolic coated |
| Capacitor | | Wax impreg. |

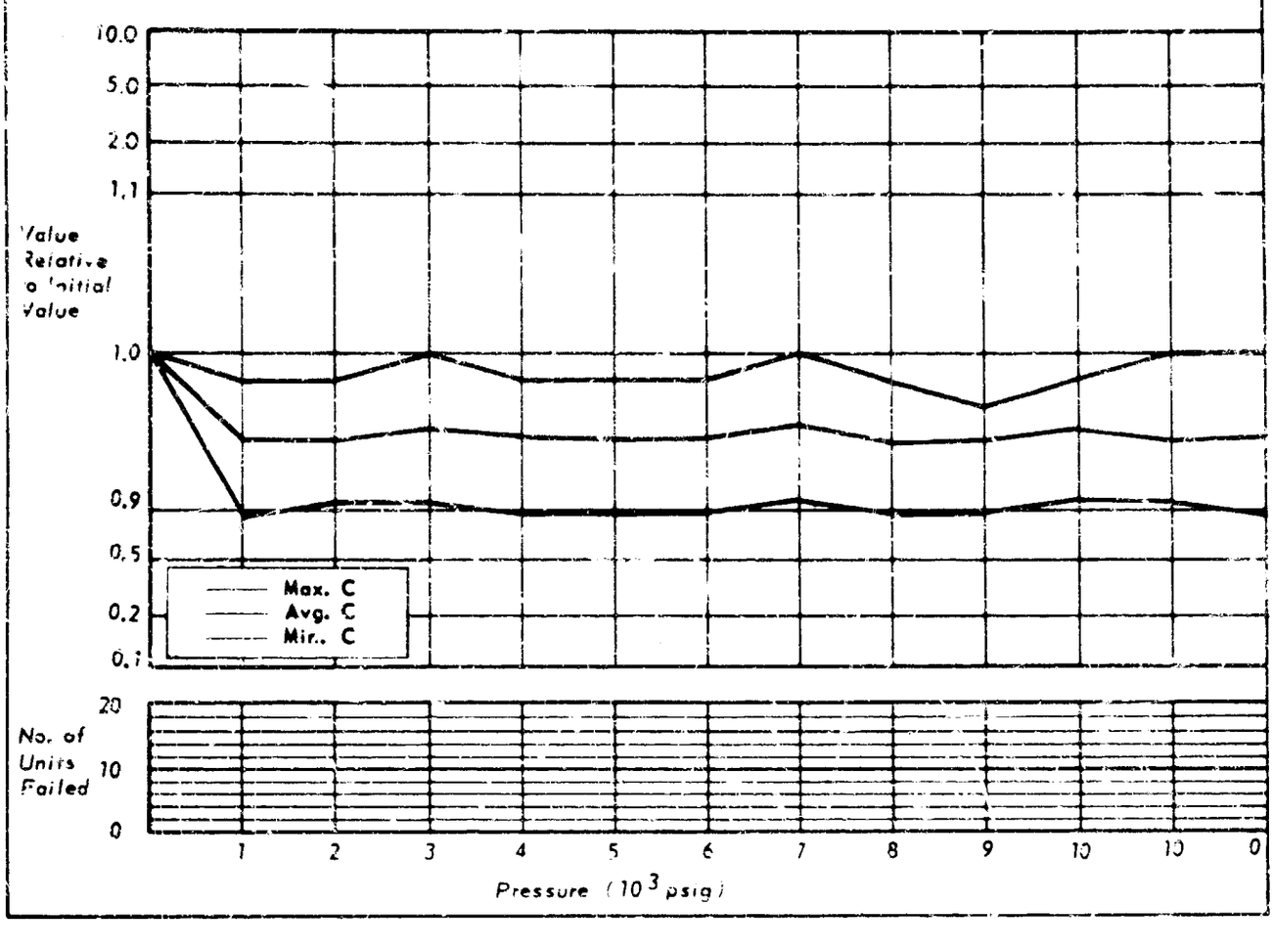
SOAK PERIOD: 14 hours at 8,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

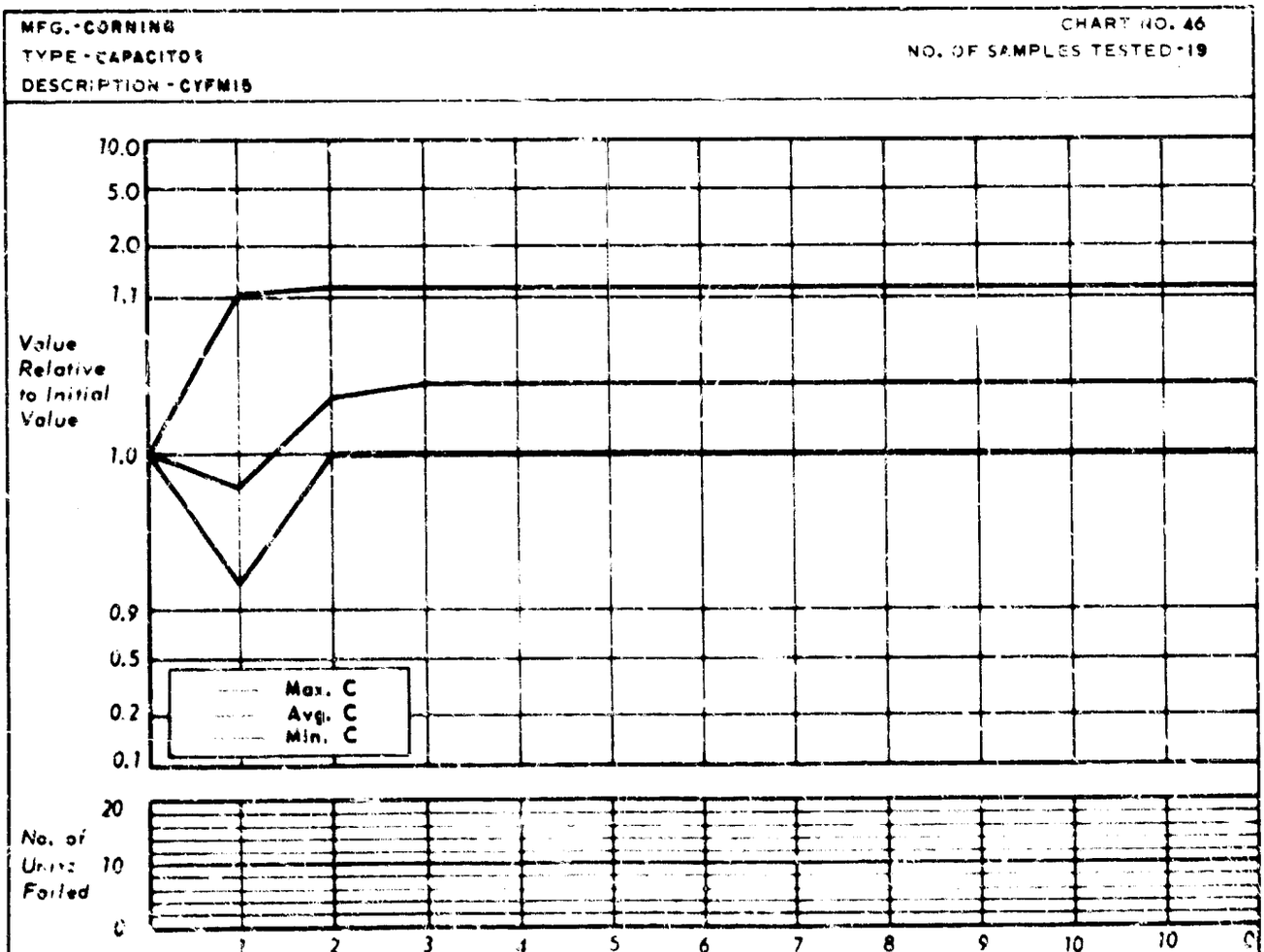
MFG. - CORNING
TYPE - CAPACITOR
DESCRIPTION - CYFM10

CHART NO. 45
NO. OF SAMPLES TESTED - 20




MFG. - CORNING
TYPE - CAPACITOR
DESCRIPTION - CYFM15

CHART NO. 46
NO. OF SAMPLES TESTED - 19



| | | |
|---|---|---|
| Corning | 100 pF ± 10% | Glass, foil |
| CYMF 10 | 300 VDCW | Rectangular, axial lead |
| Capacitor | | 0.406 x 0.203 x 0.78" th. |

SOAK PERIOD: 16 hours at 10,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: Nineteen components indicated less than 10% change.
One component indicated a change greater than 10% and less than 50%

| | | |
|---|---|---|
| Corning | 680 pF ± 5% | Glass, foil |
| CYFM 15 | 300 VDCW | Rectangular, axial lead |
| Capacitor | | 0.468 x 0.265 x 0.11" th. |

SOAK PERIOD: 15.5 hours at 10,000 psig.

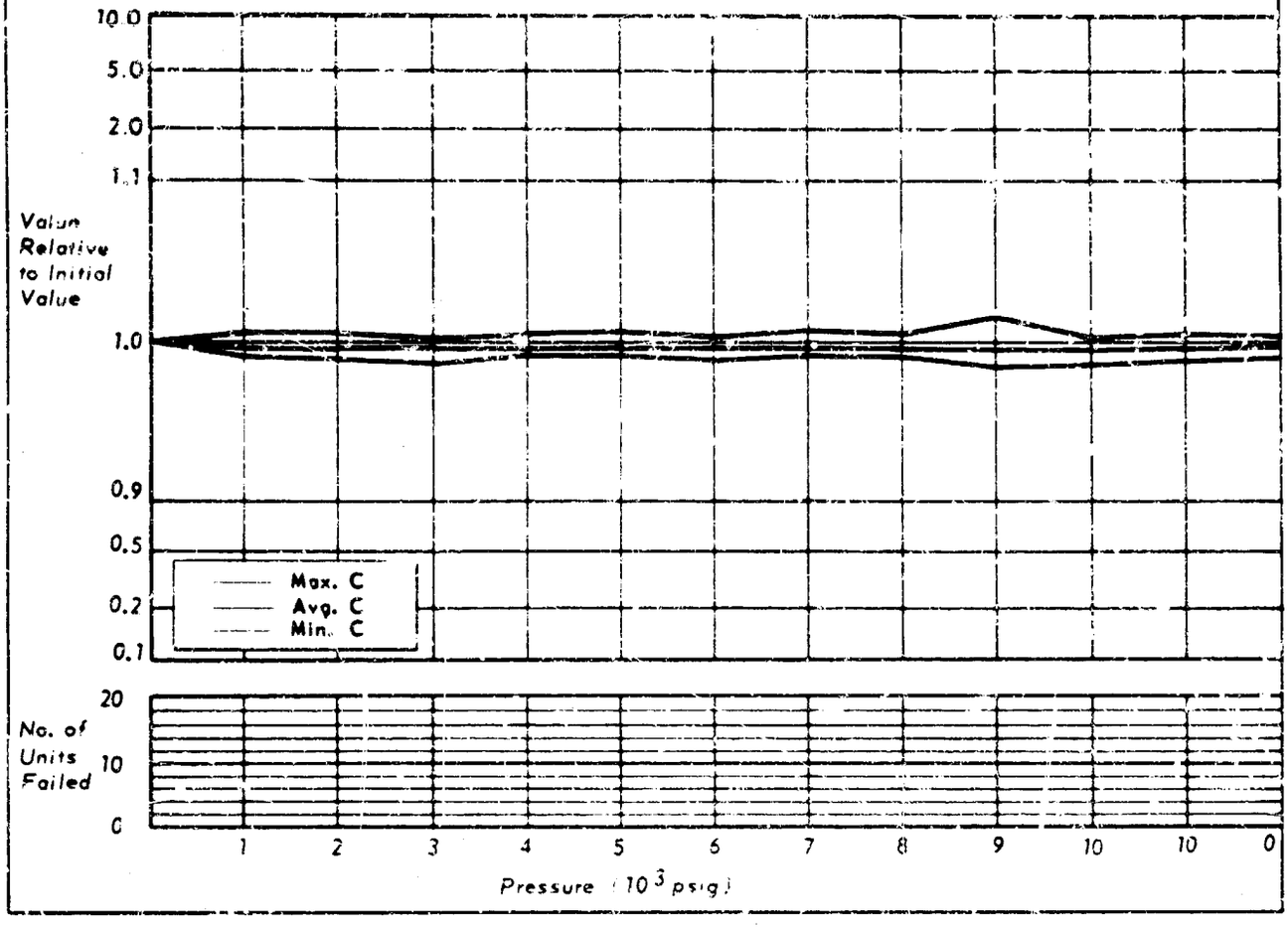
MECHANICAL: No apparent damage.

ELECTRICAL: Nineteen components indicated less than 10% change. One component indicated a change greater than 10% and less than 50%.

55

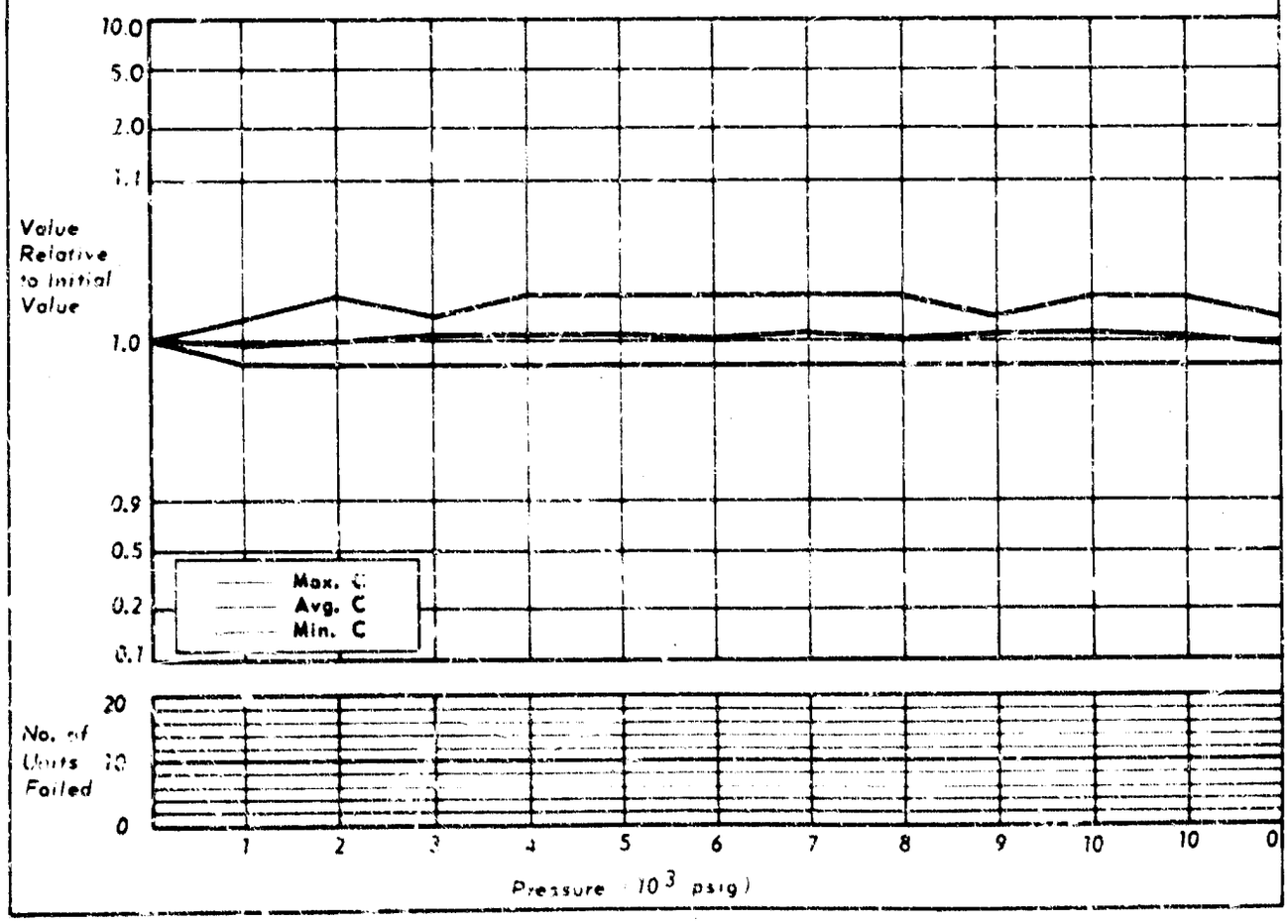
MFG. - CORNING
TYPE - CAPACITOR
DESCRIPTION - CYFM20

CHART NO. 47
NO. OF SAMPLES TESTED - 20




MFG. - CORNING
TYPE - CAPACITOR
DESCRIPTION - CYFM30

CHART NO. 48
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Corning | 4700 pF ± 5% | Glass, foil |
| CYFM 20 | 300 VDCW | Rectangular, axial lead |
| Capacitor | | 0.468 x 0.265 x 0.11" th. |

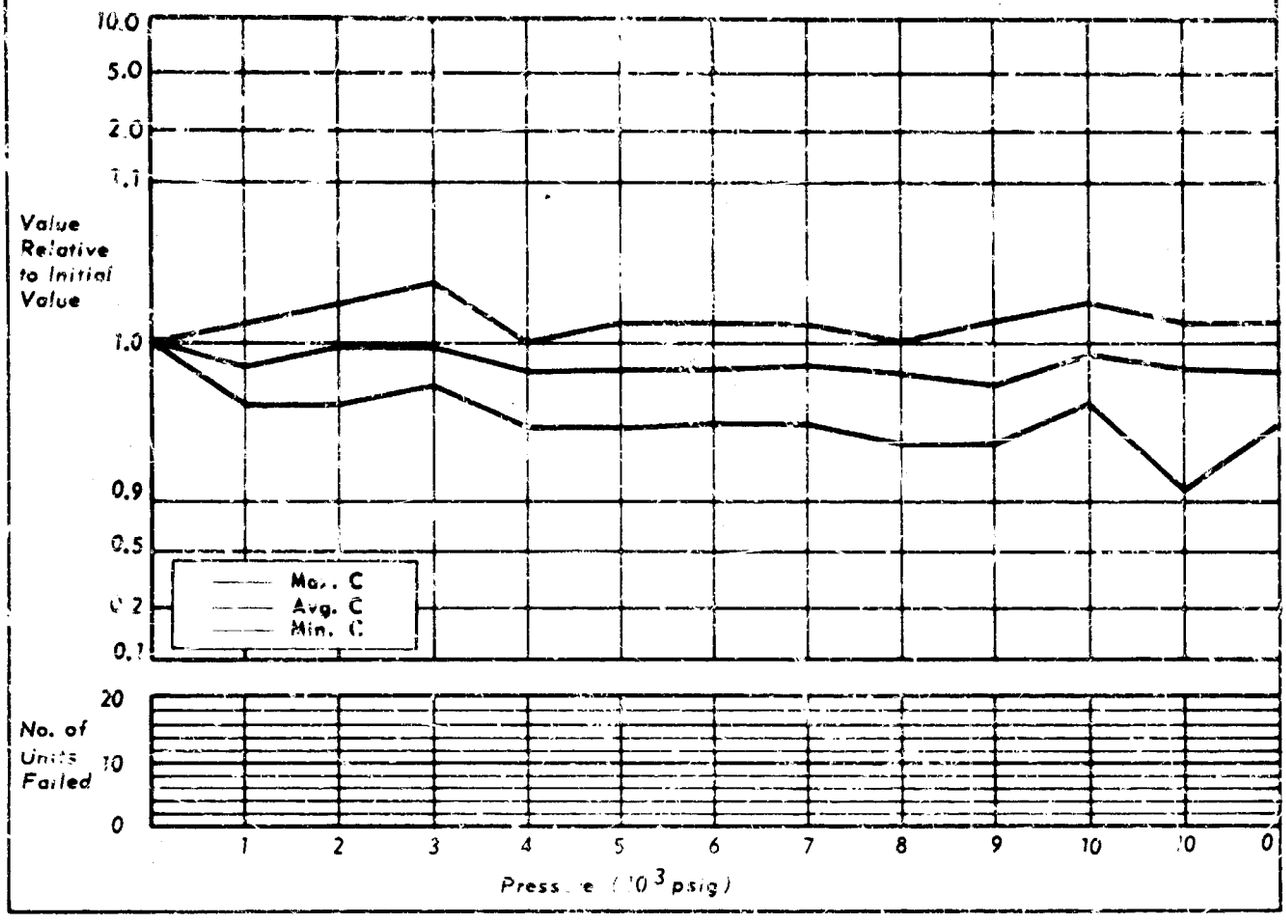
SOAK PERIOD: 16 hours at 3,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Corning | 6800 pF ± 5% | Glass, foil |
| CYFM 30 | 500 V | Rectangular, axial lead |
| Capacitor | | 0.76 x 0.76 x 0.16" th. |

SOAK PERIOD: 15.5 hours at 10,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

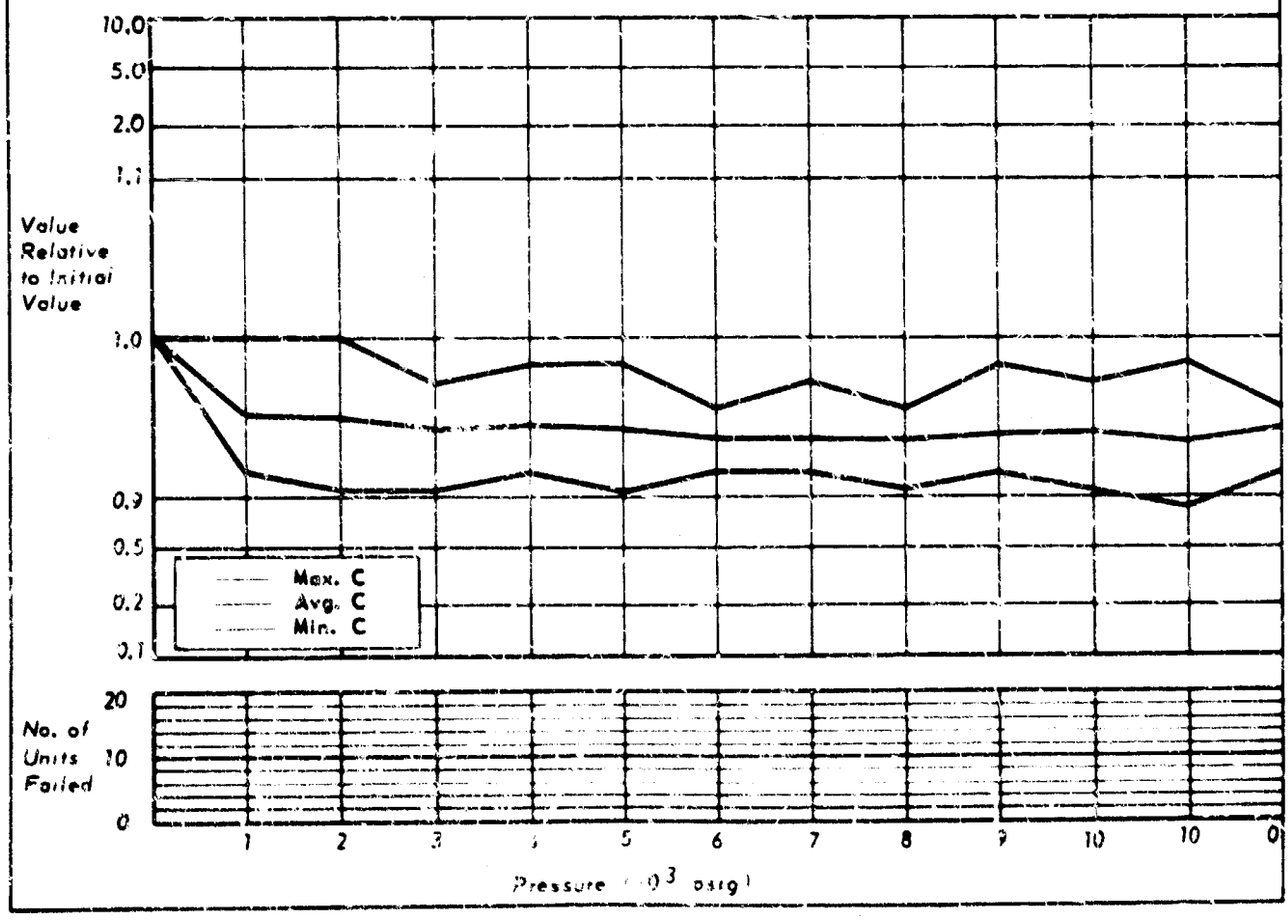
MFG. - CORNING
TYPE - CAPACITOR
DESCRIPTION - TY08

CHART NO. 49
NO. OF SAMPLES TESTED - 2




MFG. - CORNING
TYPE - CAPACITOR
DESCRIPTION - TY07

CHART NO. 50
NO. OF SAMPLES TESTED - 19



| | | |
|---|---|---|
| Corning<br>TY 06<br>Capacitor | 300 pF ± 2%<br>300 VDCW | Glass, foil<br>Rectangular, radial lead<br>Molded case<br>0.3 x 0.2 x 0.115" th. |

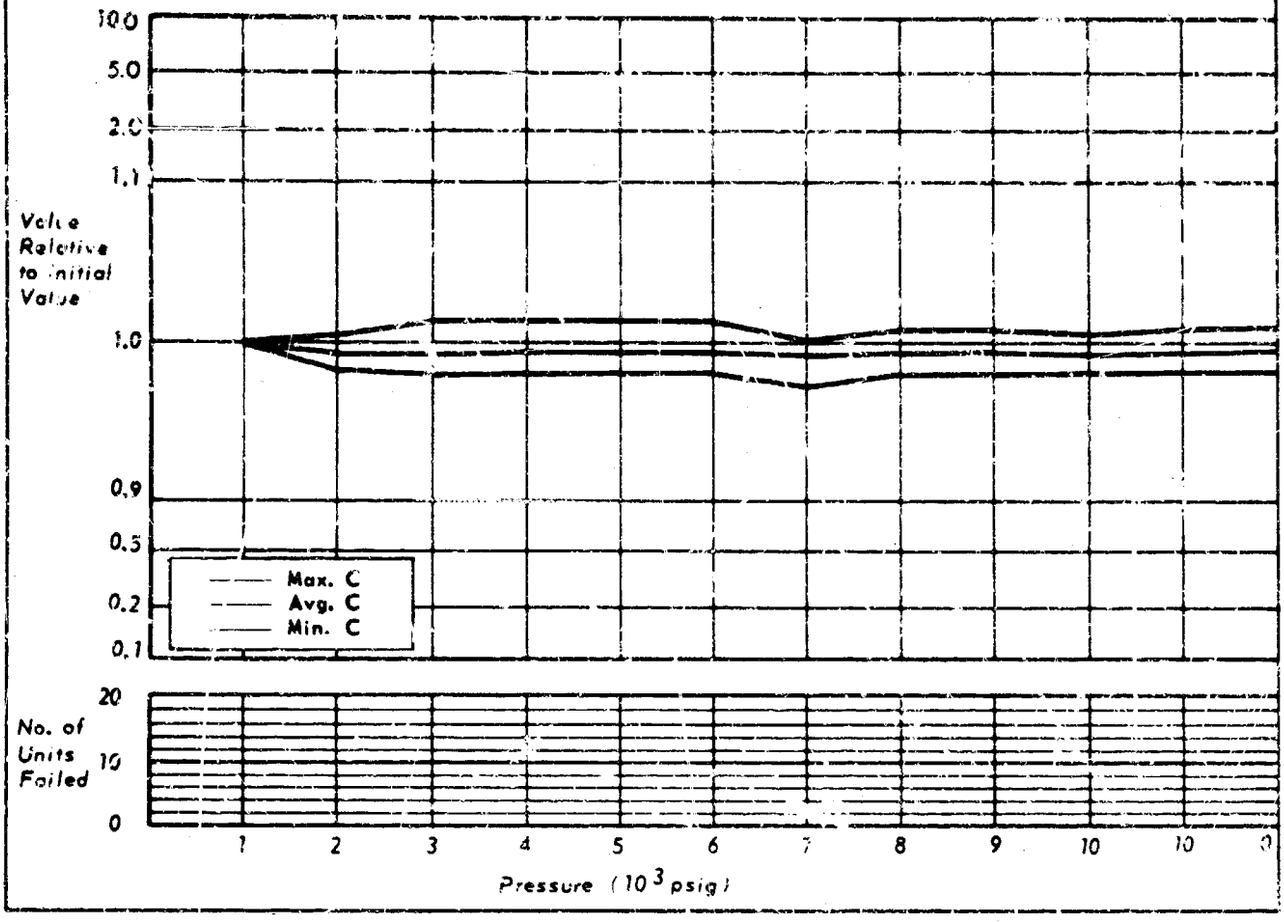
SOAK PERIOD: 16 hours at 3,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Corning<br>TY07<br>Capacitor | 600 pF ± 5%<br>300 VDCW | Glass, foil<br>Rectangular, radial lead<br>molded case<br>0.3 x 0.3 x 0.11" th. |

SOAK PERIOD: 16 hours at 3,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

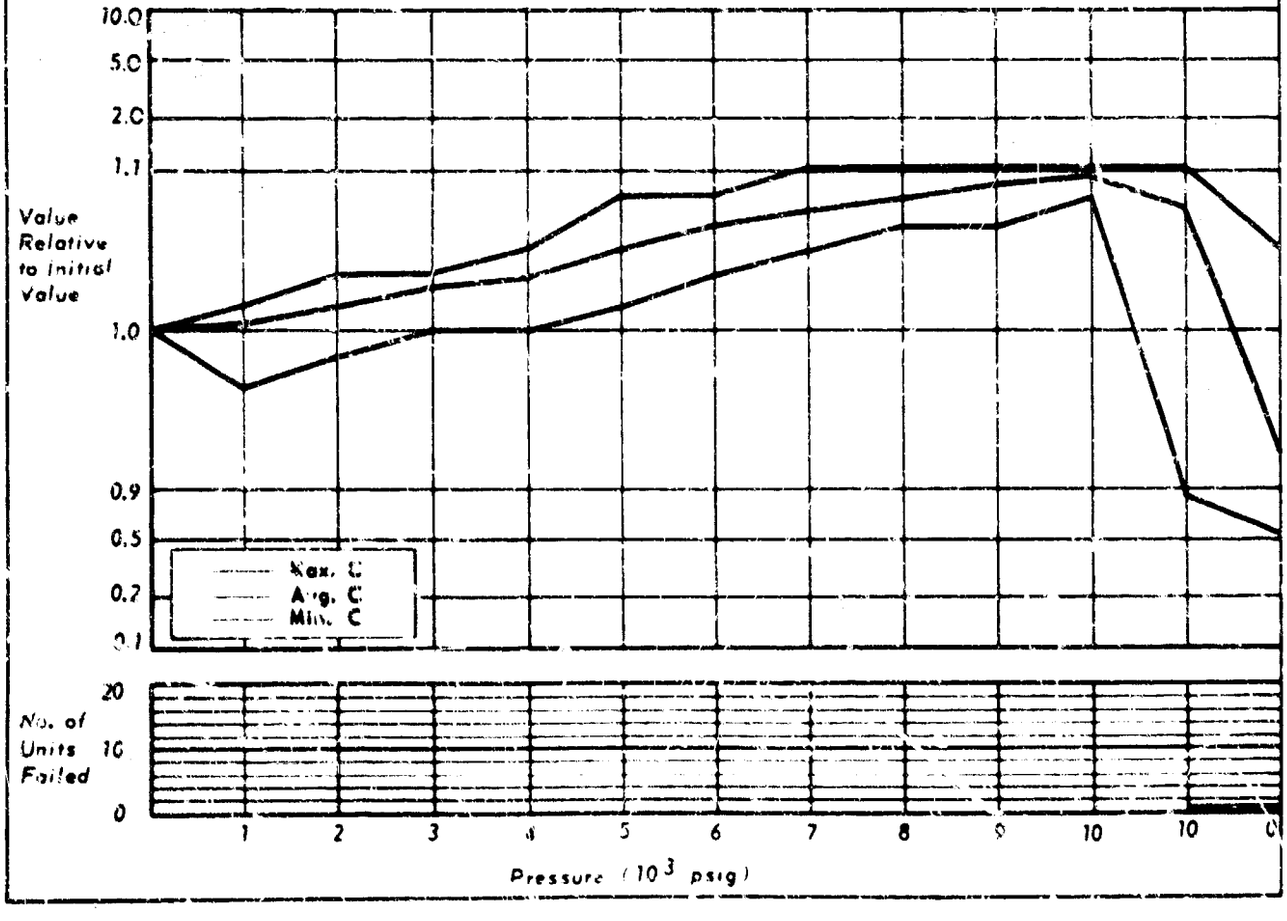
MFG. - CORNING
TYPE - CAPACITOR
DESCRIPTION - TYPE

CHART NO. 51
NO. OF SAMPLES TESTED - 20




MFG. - POTTER
TYPE - CAPACITOR
DESCRIPTION - 2002-621J

CHART NO. 52
NO. OF SAMPLES TESTED - 19



| | | |
|---|---|---|
| Corning | 2000 pF ± 1% | Glass, foil |
| TY08 | 300 VDCW | Rectangular, radial lead |
| Capacitor | | Molded case |
| | | 0.3 x 0.3 x 0.115" th. |

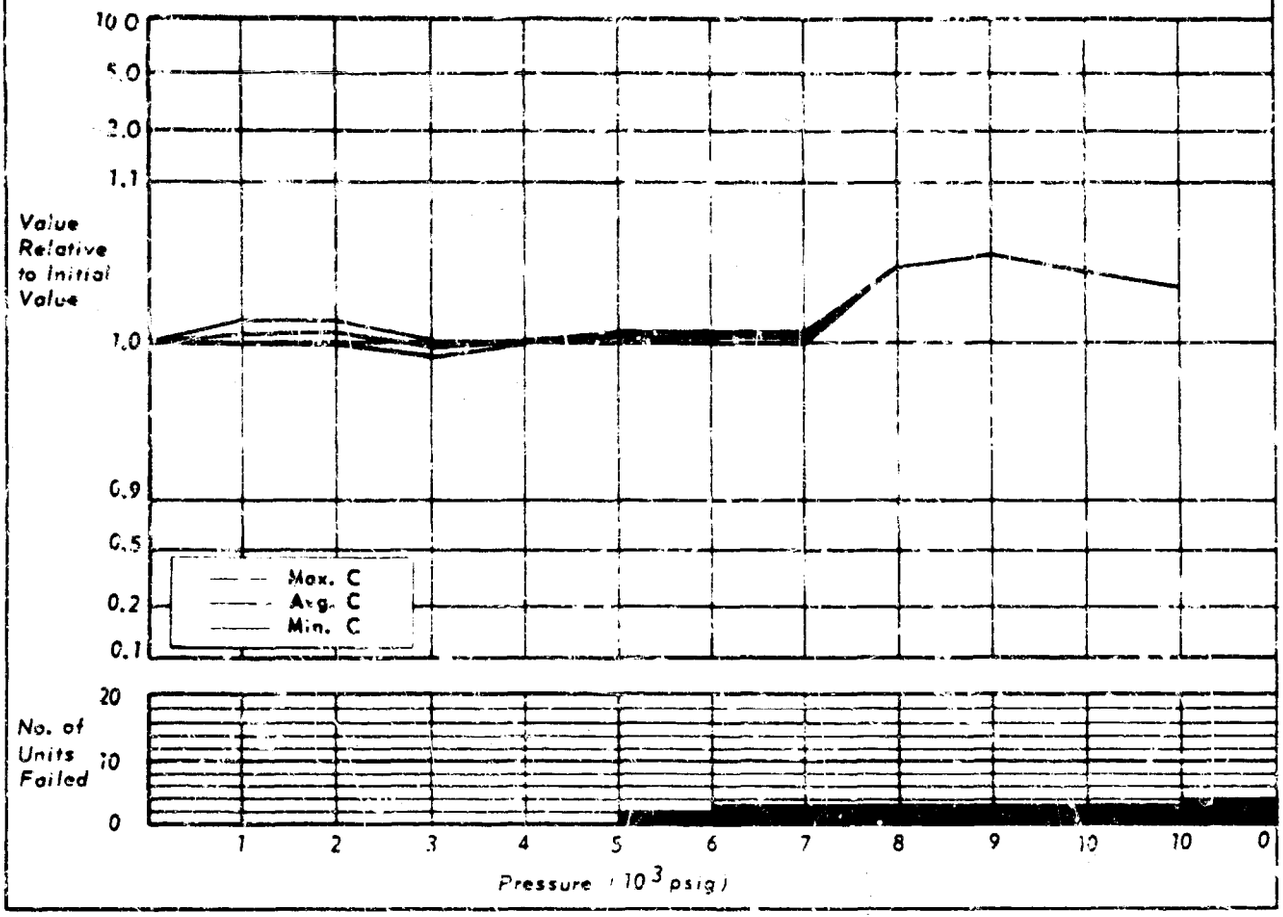
SOAK PERIOD: 15.5 hours at 10,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Potter | 620 pF ± 5% | Ceramic, dice |
| 2002-621J | 200 VDCW | Tubular, axial lead |
| Capacitor | | 0.25 x 0.1" diam. |

SOAK PERIOD: None
MECHANICAL: No apparent damage.
ELECTRICAL: Twelve components indicated less than 10% change.
Six components indicated a change greater than 10% and less than 50%.
FAILURES: One component indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.

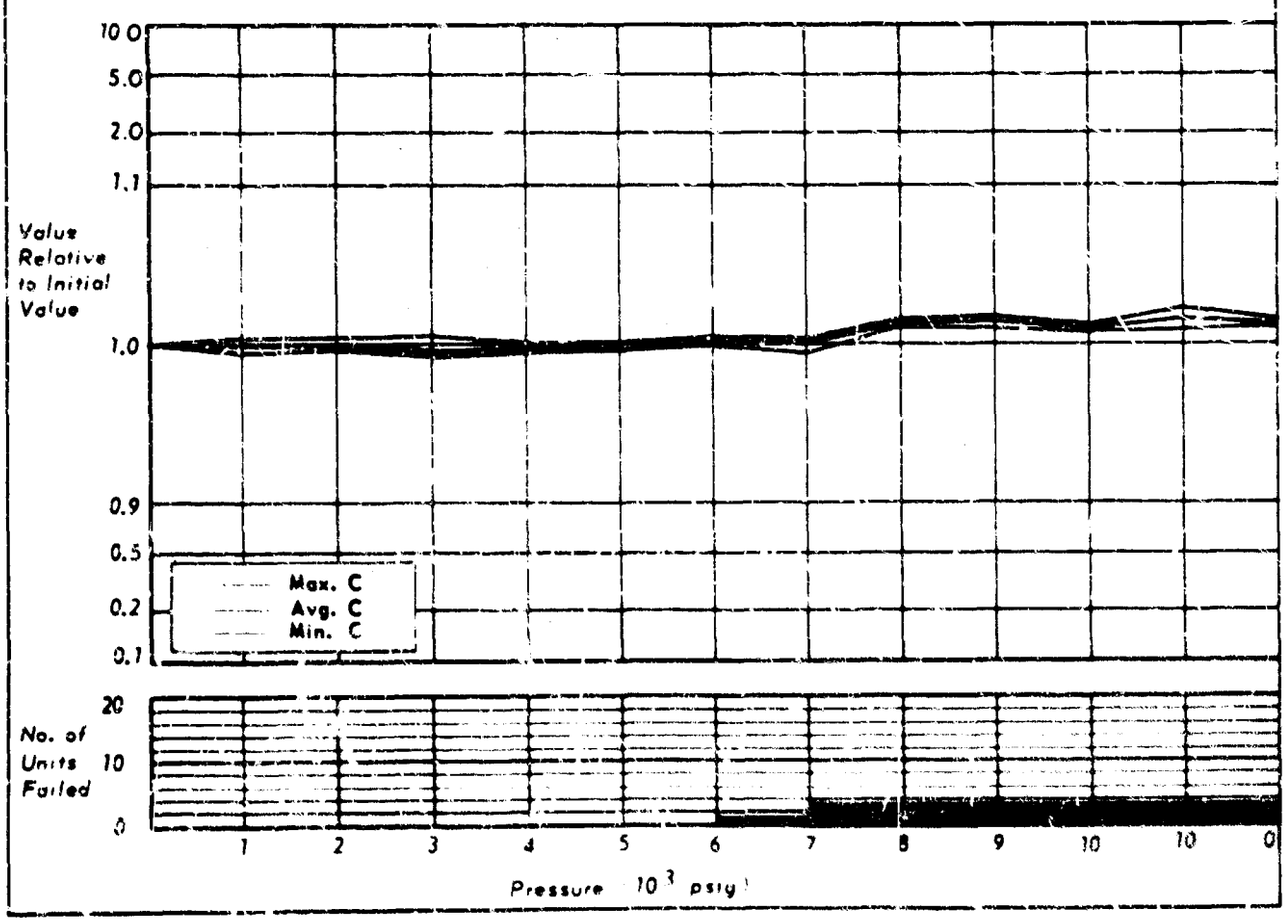
MFG. - TEXAS INSTRUMENTS
TYPE - CAPACITOR
DESCRIPTION - SCM1588Z035A2

CHART NO. 53
NO. OF SAMPLES TESTED - 4




MFG. - TEXAS INSTRUMENTS
TYPE - CAPACITOR
DESCRIPTION - SCM8258P020A2

CHART NO. 54
NO. OF SAMPLES TESTED - 5



| | | |
|---|---|---|
| Texas Instruments | 1.5 μF | Electrolytic |
| SCM 155BP035A | 35 VDCW | Tantalum solid |
| Capacitor | | Tubular, axial lead |
| | | 0.438 x 0.175" diam. |

SOAK PERIOD: 16 hours at 3,000 psig.

MECHANICAL: Visual inspection after completion of test showed end seals broken on three components.

ELECTRICAL: One component indicated less than 10% change.

FAILURES: Four components indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.

| | | |
|---|---|---|
| Texas Instruments | 8.2 μF | Electrolytic |
| SCM 825BP020A2 | 200 VDCW | Tantalum, solid |
| Capacitor | | Tubular, axial lead |
| | | 0.438 x 0.175" diam. |

SOAK PERIOD: 16 hours at 3,000 psig.

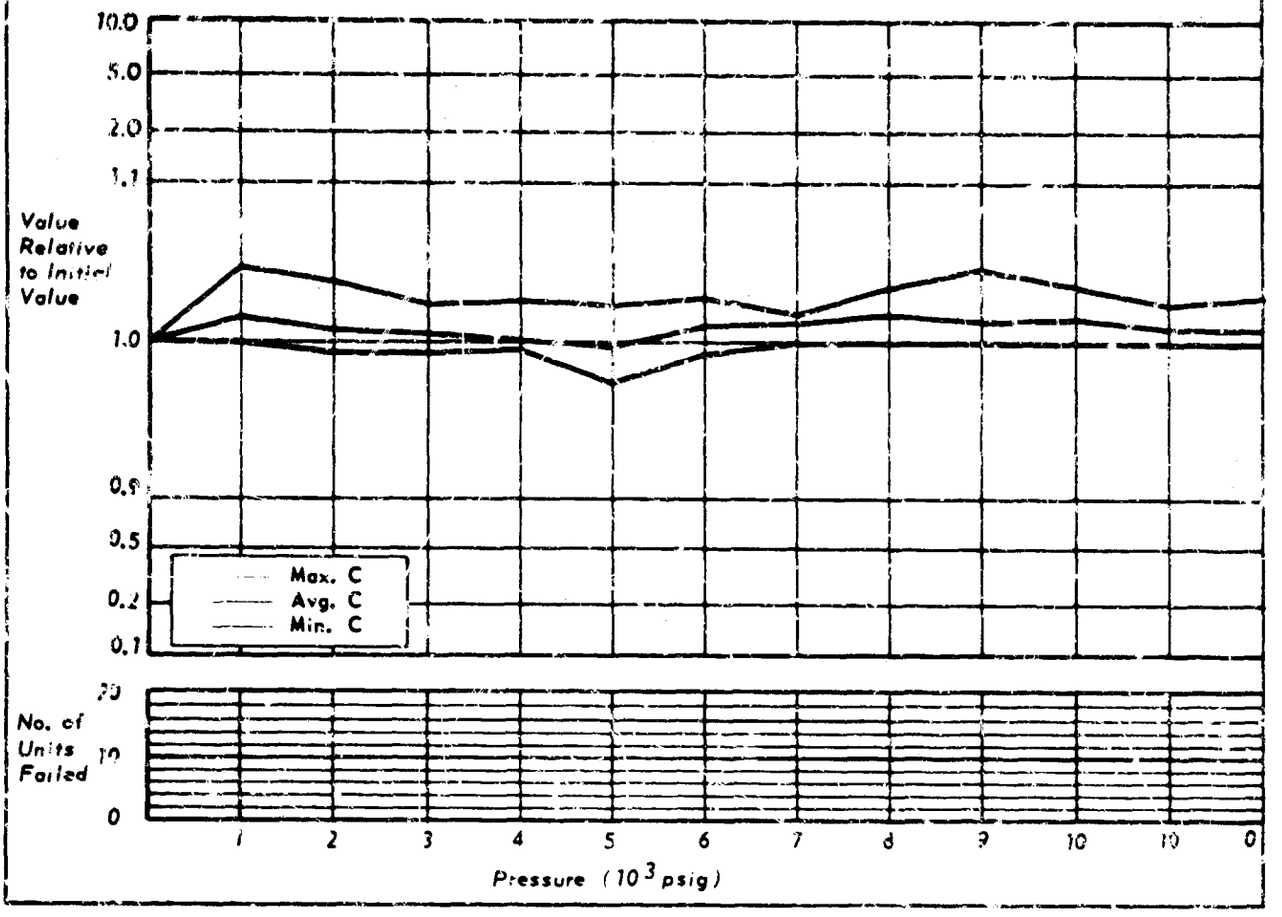
MECHANICAL: Visual inspection after completion of test showed deformation of the metal casing on three components and displacement of two end seals.

ELECTRICAL: Two components indicated less than 10% change.

FAILURES: Three components indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.

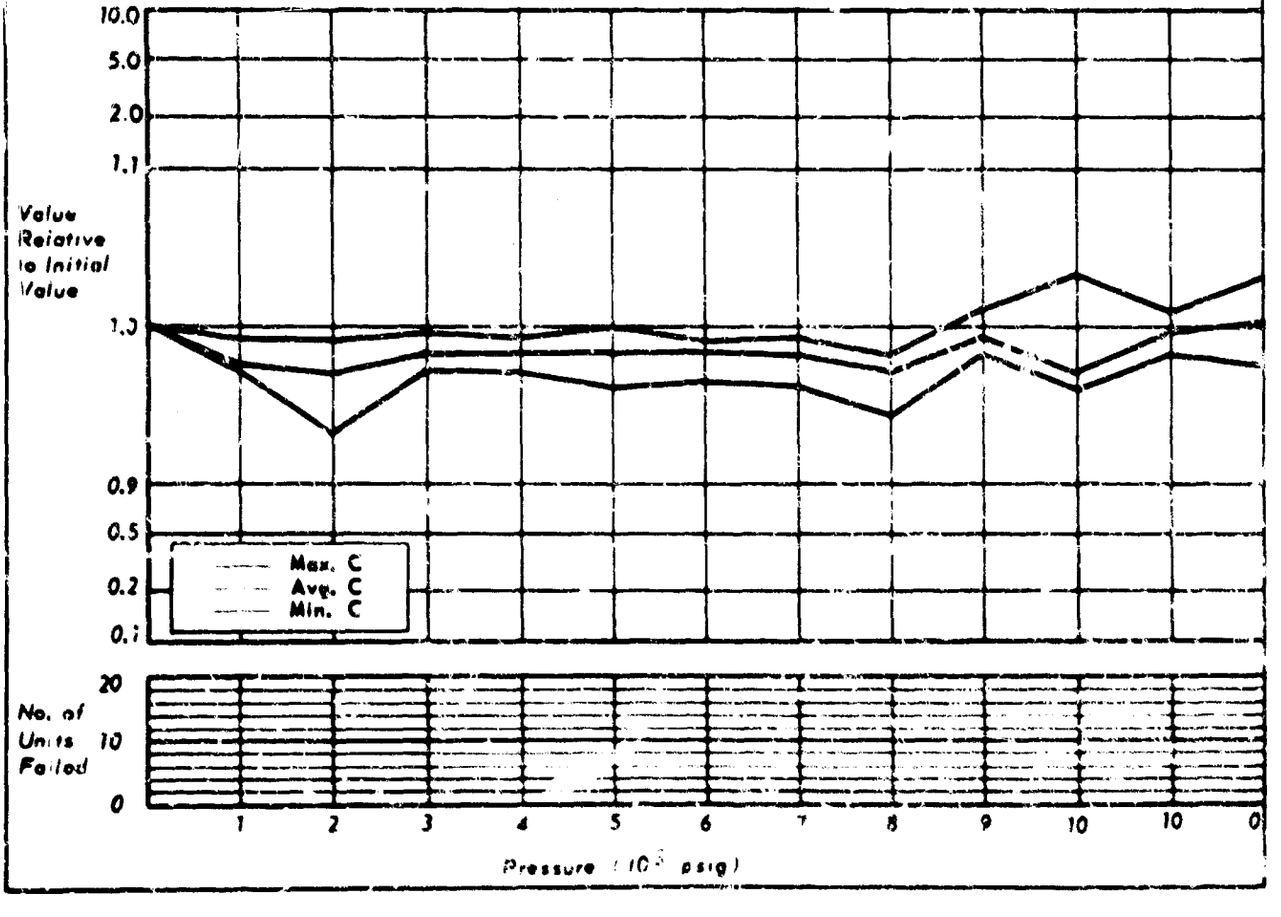
MFG. - TEXAS INSTRUMENTS
TYPE - CAPACITOR
DESCRIPTION - SCM2268P010A2

CHART NO. 55
NO. OF SAMPLES TESTED - 8




MFG. - TEXAS INSTRUMENTS
TYPE - CAPACITOR
DESCRIPTION - SCM2268P010A2

CHART NO. 56
NO. OF SAMPLES TESTED - 8



| | | |
|---|---|---|
| Texas Instruments<br>SCH226BP010A<br>Capacitor | 22.0 μF<br>15 VDCW | Electrolytic<br>Tantalum, solid<br>Tubular, axial lead<br>0.438 x 0.175" diam. |

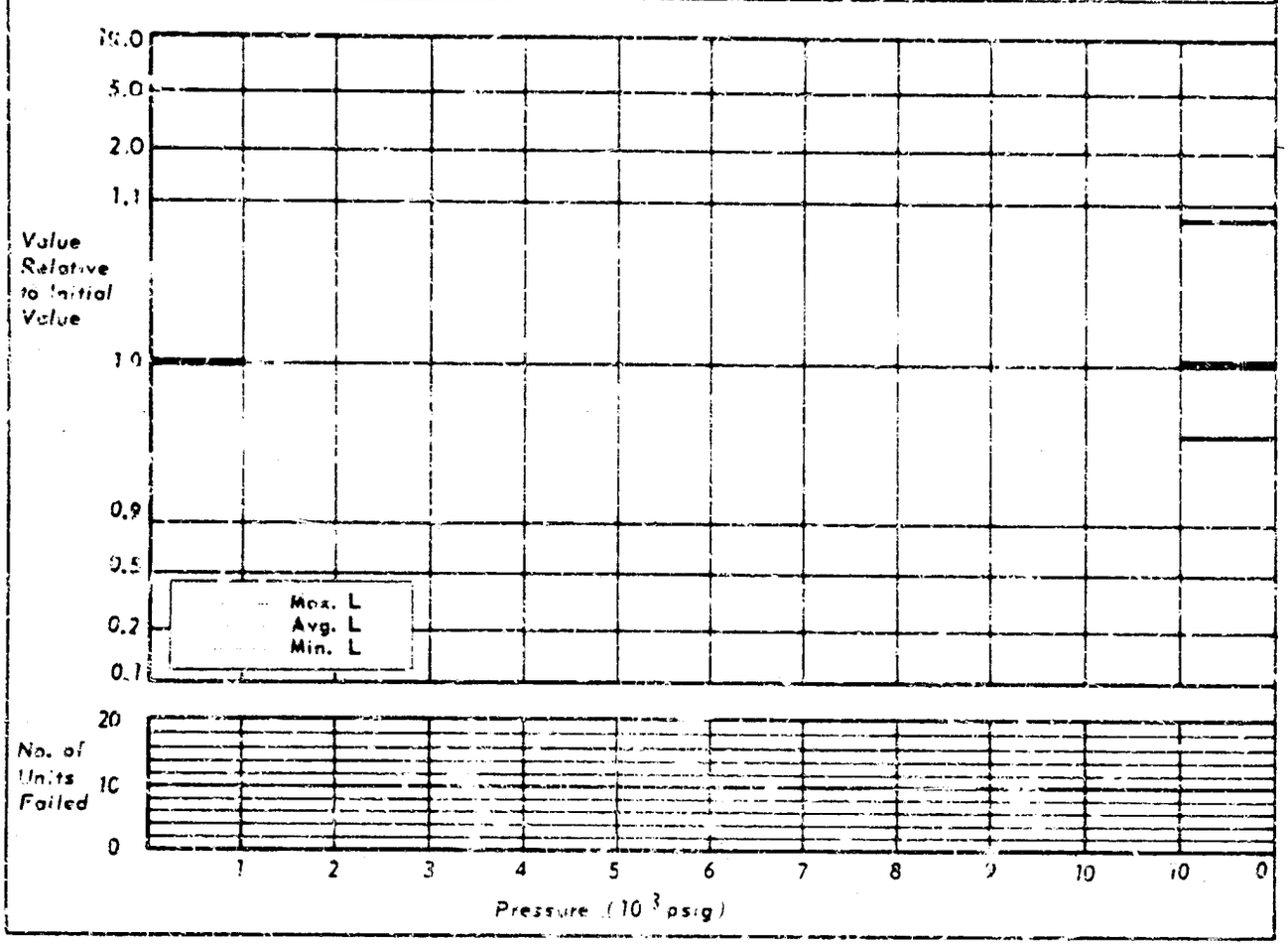
SOAK PERIOD: 16 hours at 3,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Texas Instruments<br>SCM476BP006A2<br>Capacitor | 47.0 μF<br>6 VDCW | Electrolytic<br>Tantalum, solid<br>Tubular, axial lead<br>0.438 x 0.175" diam. |

SOAK PERIOD: 16 hours at 3,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All Components indicated less than 10% change.

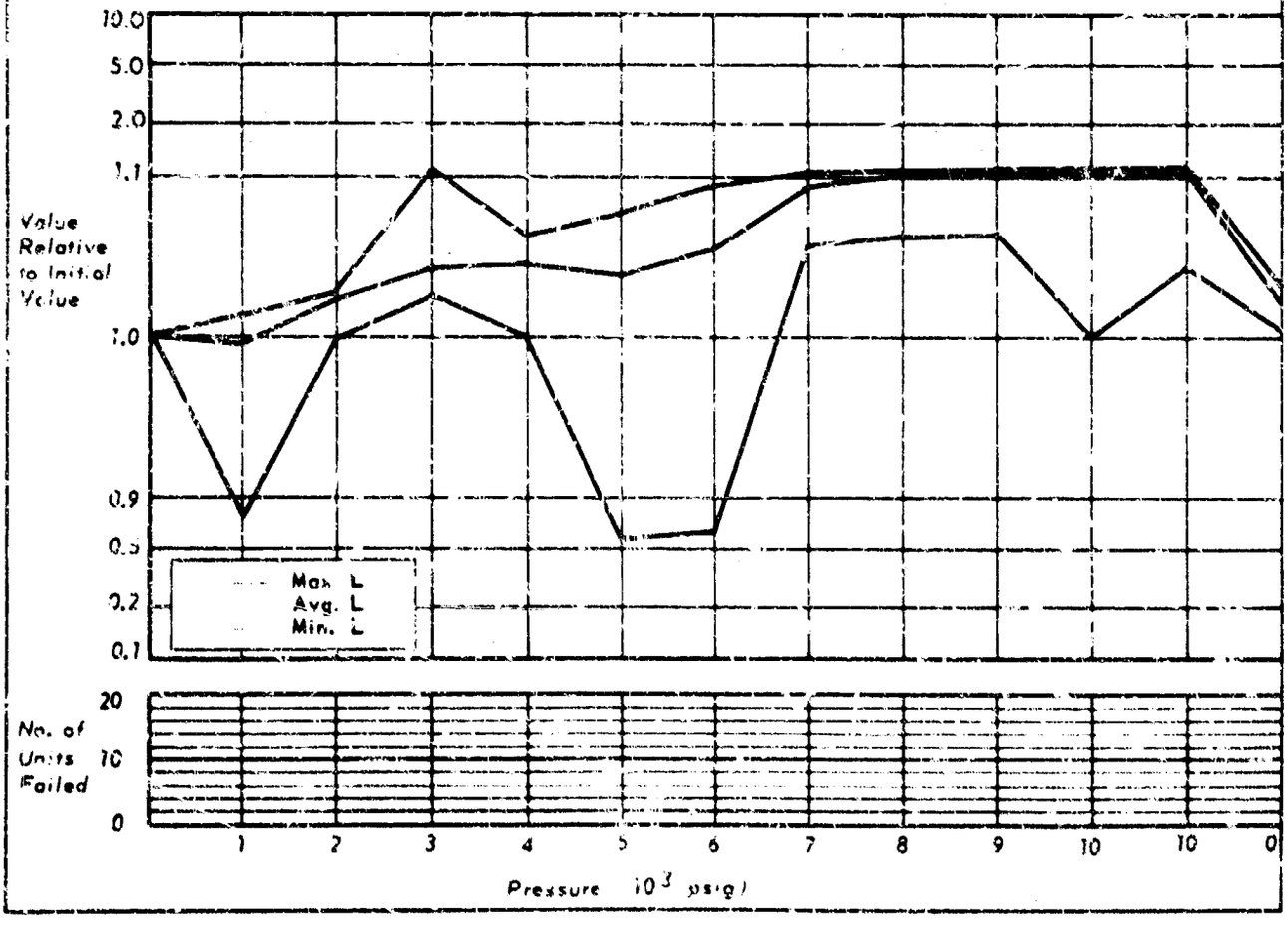
MFG.-GENERAL INSTRUMENTS
TYPE-R F COIL
DESCRIPTION-M# 75008-8

CHART NO. 57
NO. OF SAMPLES TESTED-19




MFG.-GENERAL INSTRUMENTS
TYPE-COIL
DESCRIPTION-SM-2-249219

CHART NO. 58
NO. OF SAMPLES TESTED-19



| | | |
|---|---|---|
| General Instruments | 2.2 $\mu$H | Molded |
| FW Sickles Division | at 7.9 Mc | Cylindrical, axial lead |
| MS 75008-8 | | 0.45 x 0.18" diam. |
| RF coil | | |

SOAK PERIOD: None

NOTE: Due to the low inductance value of the component relative to the inherent inductance of the test system measurements within the chamber where considered invalid.

The set was subjected to the entire pressure test program, however, only the readings taken before and after test were graphed. These readings appear in the first and last positions on the opposite graph.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change after completion of test.

| | | |
|---|---|---|
| General Instruments | 12 $\mu$H | Toroidal, molded |
| M-6-249219 | at 150 kc | Pill box, radial lead |
| Coil | | 0.75 x 0.7 x 0.15" |

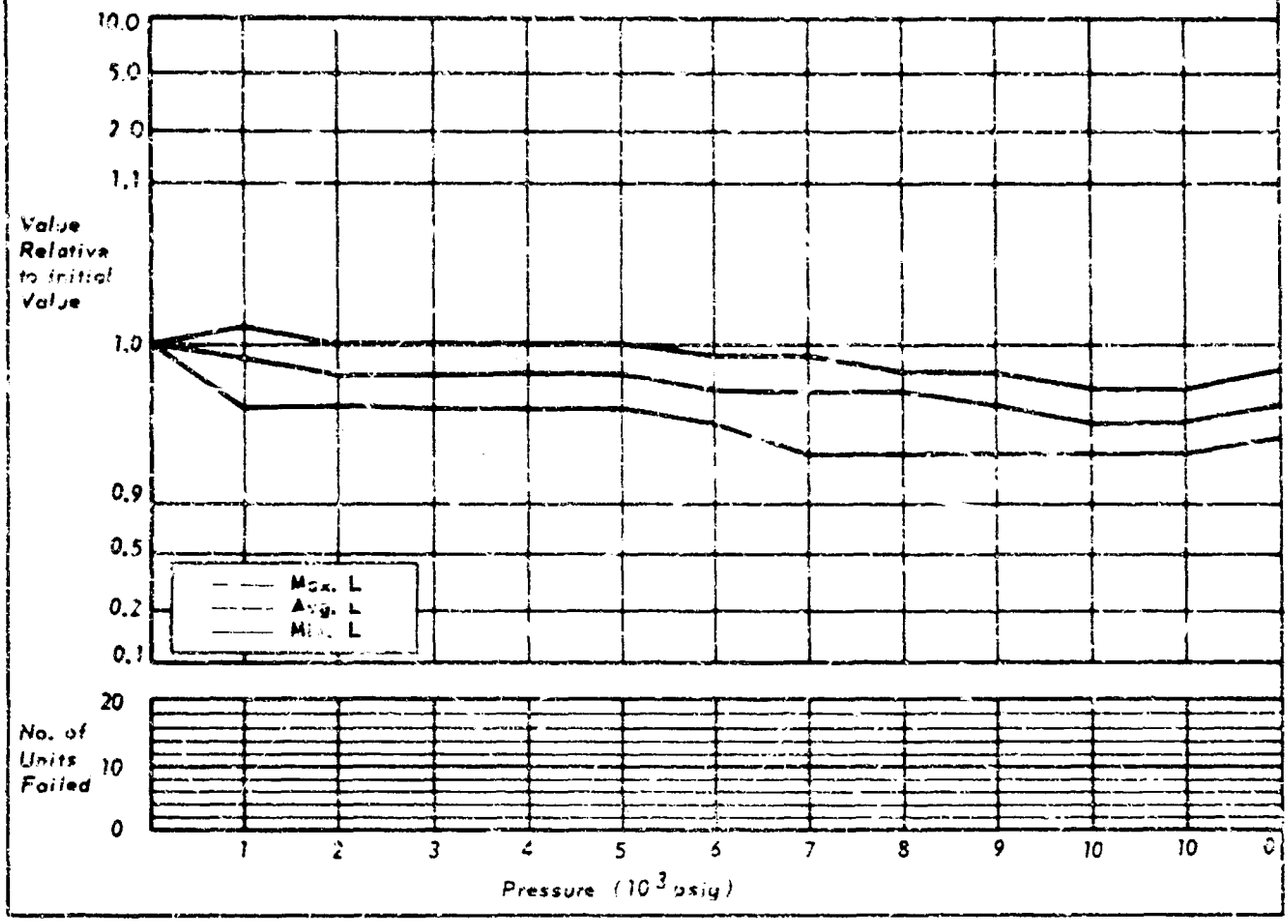
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: Eighteen components indicated less than 10% change. One component indicated a change greater than 10% and less than 50%.

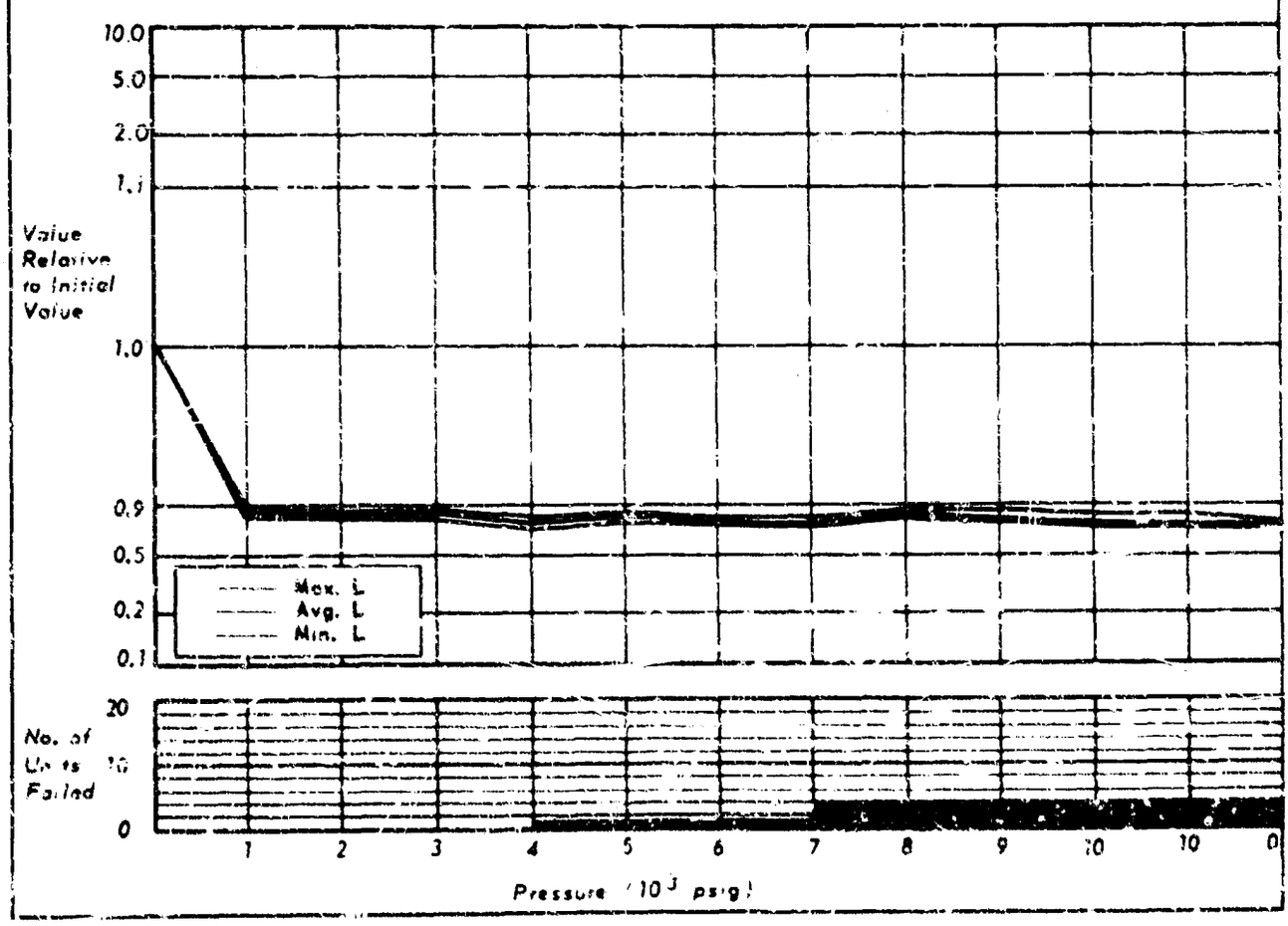
MFG - MICROTRAN
TYPE - COIL, AUDIO CHOKE
DESCRIPTION - PM 3R-M

CHART NO. 59
NO. OF SAMPLES TESTED - 6




MFG. - MICROTRAN
TYPE - COIL, CHOKE
DESCRIPTION - UM 28

CHART NO. 60
NO. OF SAMPLES TESTED - 5



| | | |
|---|---|---|
| Microtron | 6 H | Epoxy molded |
| PM 39-M | 2 mA dc | Rectangular, parallel base lead |
| Audio choke coil | 1800 DCR | 0.465 x 0.41 x 0.3" |

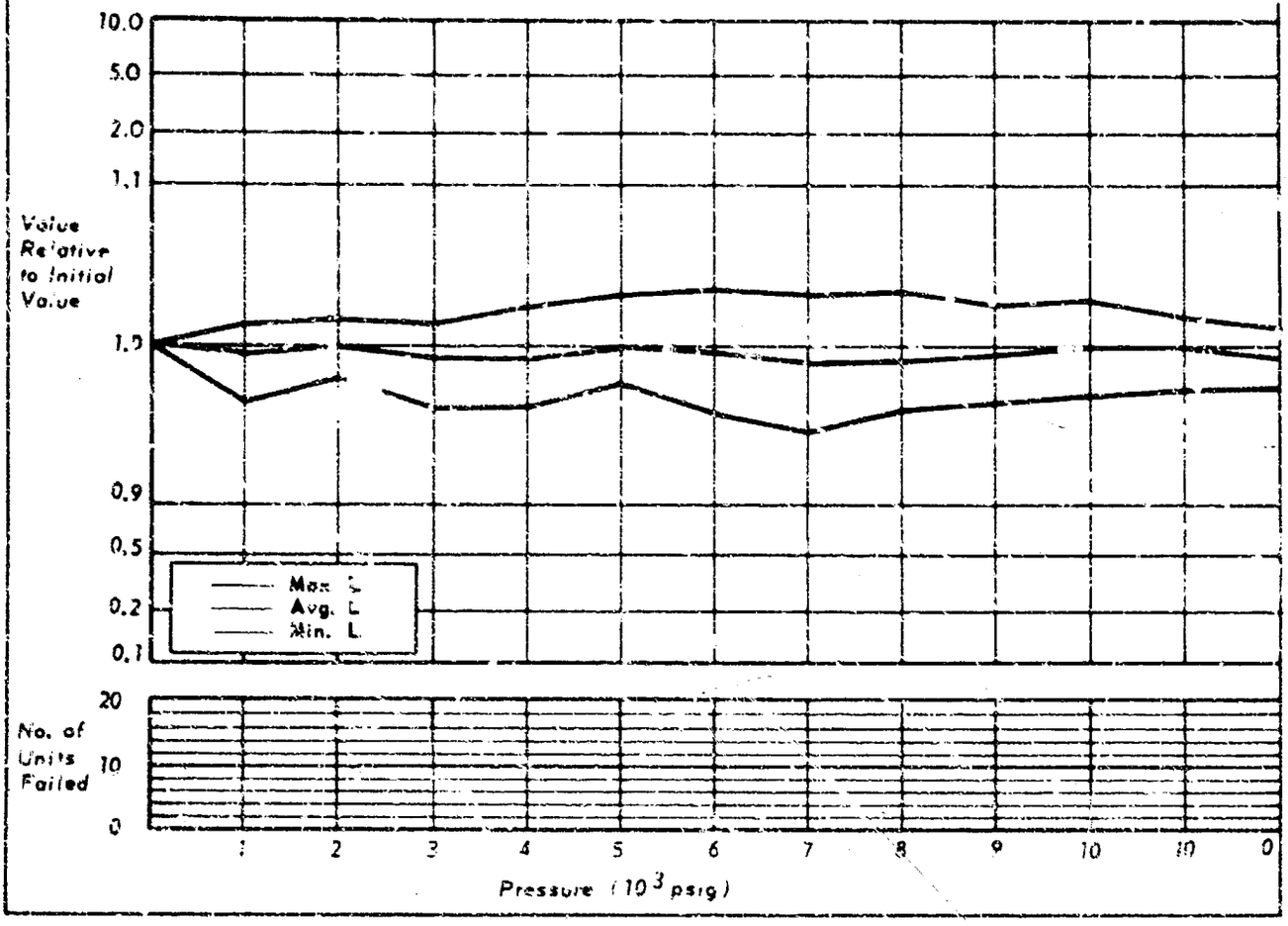
SOAK PERIOD: None
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Microtron | 8 H | Epoxy potted |
| UM 28-M | 0.5 mA dc | 0.5 x 9.562 x 0.437" |
| Choke coil | | |

SOAK PERIOD: None
MECHANICAL: Visual inspection after completion of test showed a fractured case on one sample.
ELECTRICAL: One component indicated a change greater than 10% and less than 50% change.
FAILURES: Four components indicated a permanent change greater than 50%.

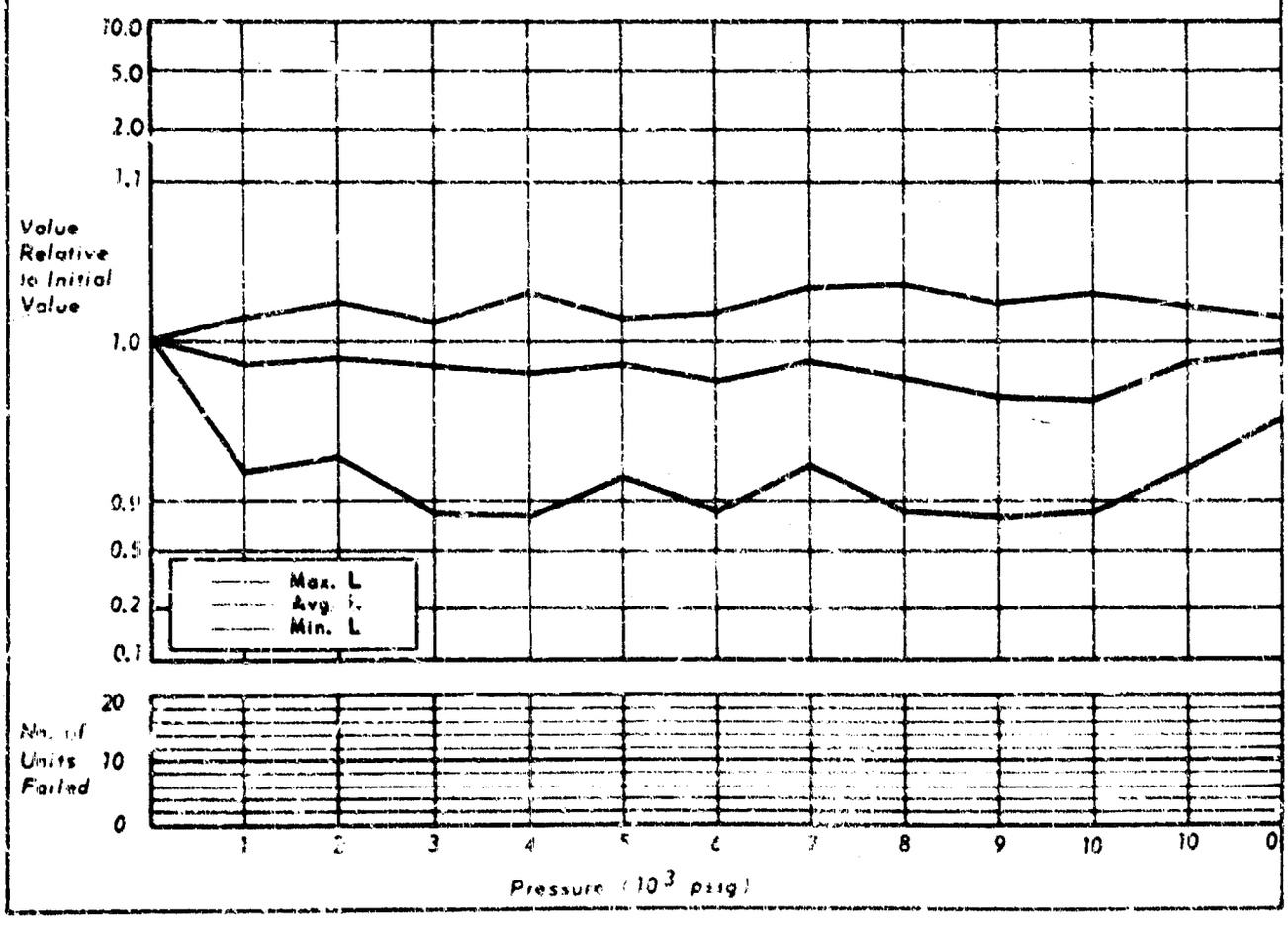
MFG. - J. W. MILLER
TYPE - R. F. CHOKE
DESCRIPTION - 9250-00

CHART NO. 61
NO. OF SAMPLES TESTED - 18




MFG. - J. W. MILLER
TYPE - R. F. CHOKE
DESCRIPTION - 9240-70P

CHART NO. 62
NO. OF SAMPLES TESTED - 17



| | | |
|---|---|---|
| J. W. Miller | 0.15 $\mu$H ± 10% | Molded case |
| 9230-00 | at 25 Mc | Tubular, axial lead |
| R. F. choke | | 0.25 x 0.10" diam. |

SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| J. W. Miller | 1.0 $\mu$H ± 10% | Molded, shielded |
| 9240-708 | at 25 Mc | Tubular, axial lead |
| R. F. choke | | 0.375 x 0.15" diam. |

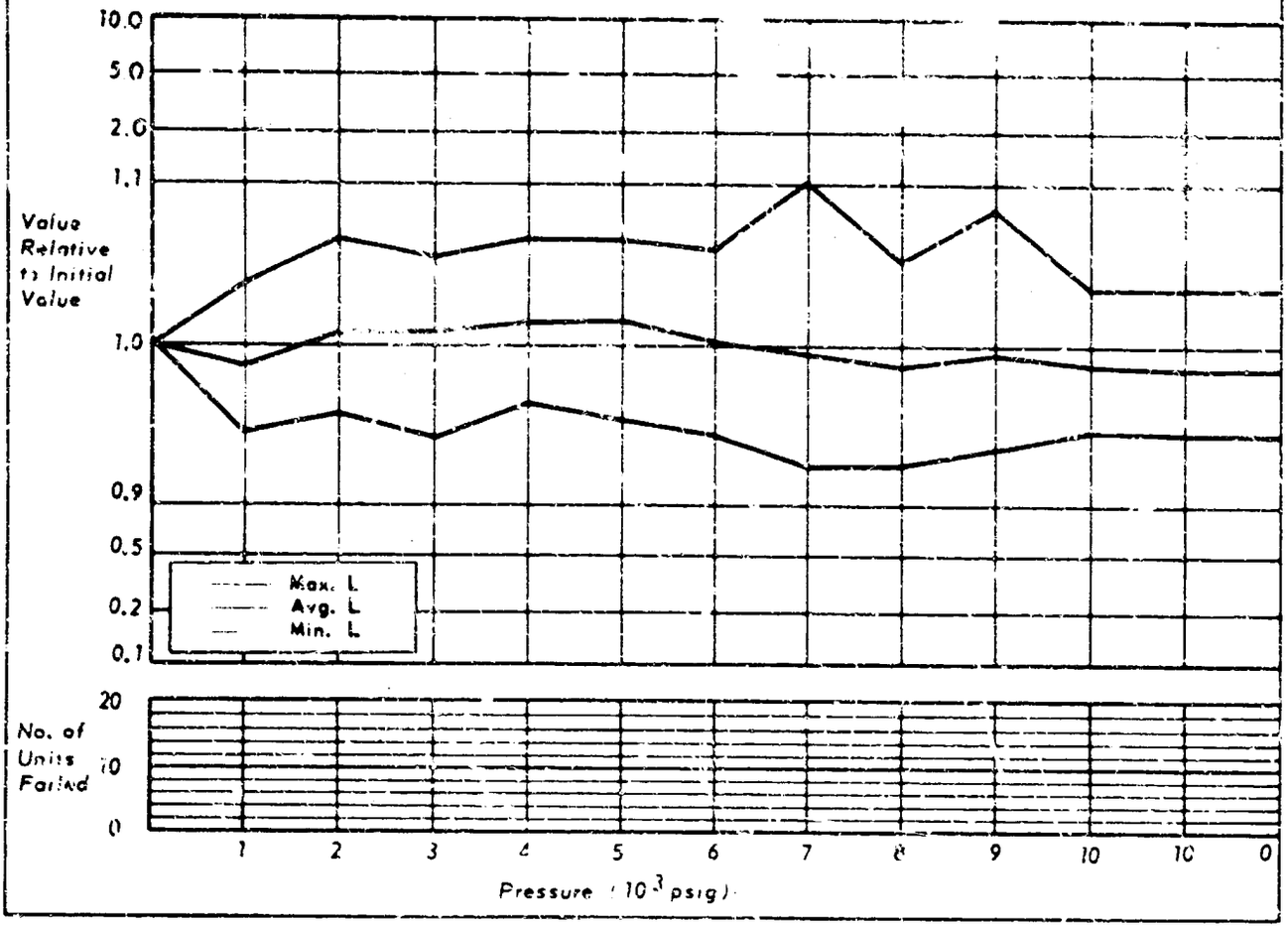
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: Sixteen components indicated less than 10% change.
One component indicated a change greater than 10% and less than 50%.

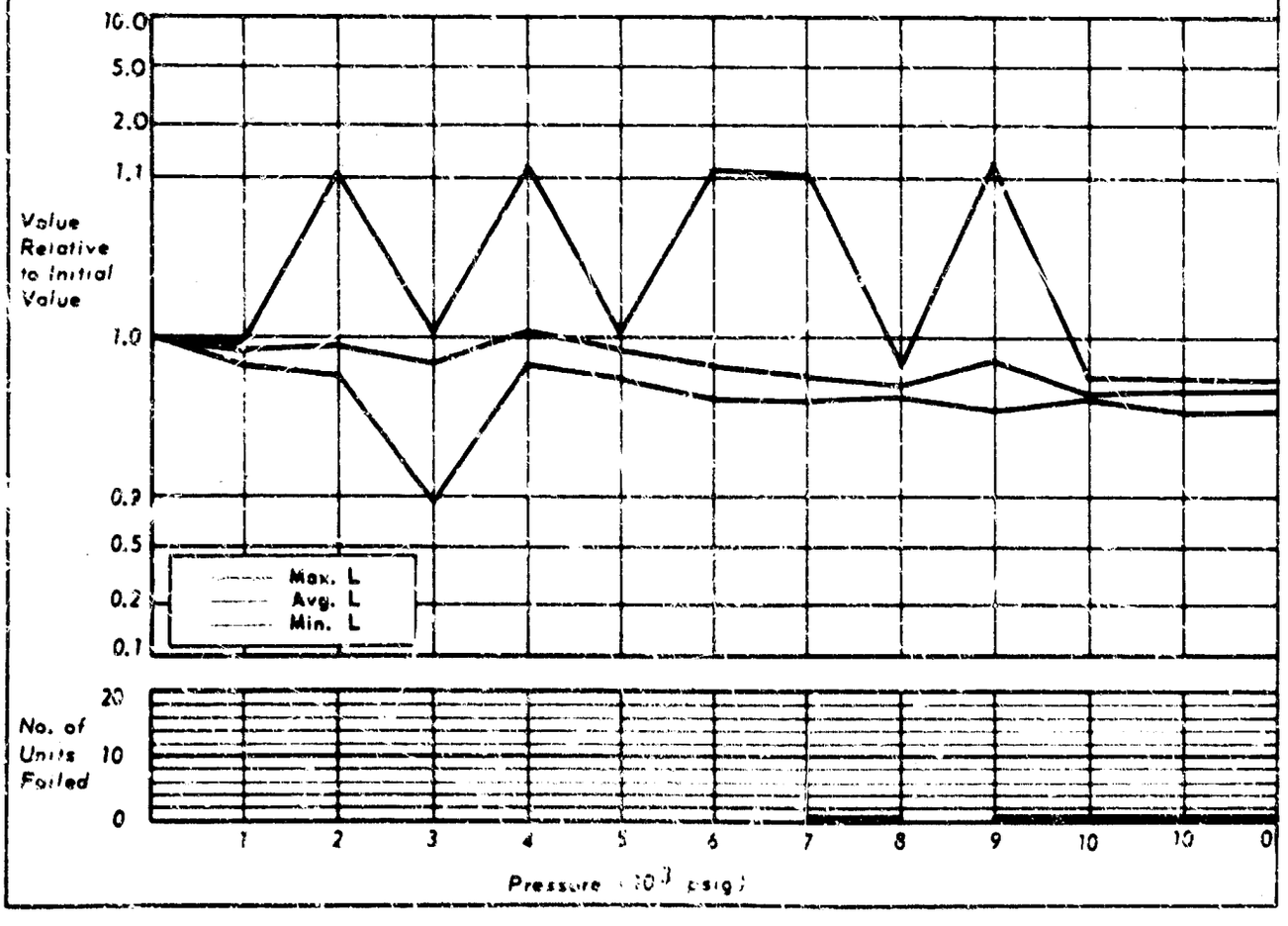
MFG.- J.W. MILLER
TYPE - R F CHOKE COIL
DESCRIPTION - 9230-00

CHART NO. 63
NO. OF SAMPLES TESTED - 20




MFG.- J.W. MILLER
TYPE - R F CHOKE COIL
DESCRIPTION - 9220-00

CHART NO. 64
NO. OF SAMPLES TESTED - 19



| | | |
|---|---|---|
| J. W. Miller | 100 μH ± 10% | Molded |
| 9230-68 | at 2.5 Mc | Tubular, axial lead |
| R. F. choke | | 0.25 x 0.10" diam. |

SOAK PERIOD: 16 hours at 8,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| J. W. Miller | 270 μH ± 5% | Molded |
| 9220-00 | at 0.79 Mc | Tubular, axial lead |
| R. F. choke | | 0.44 x 0.19" diam. |

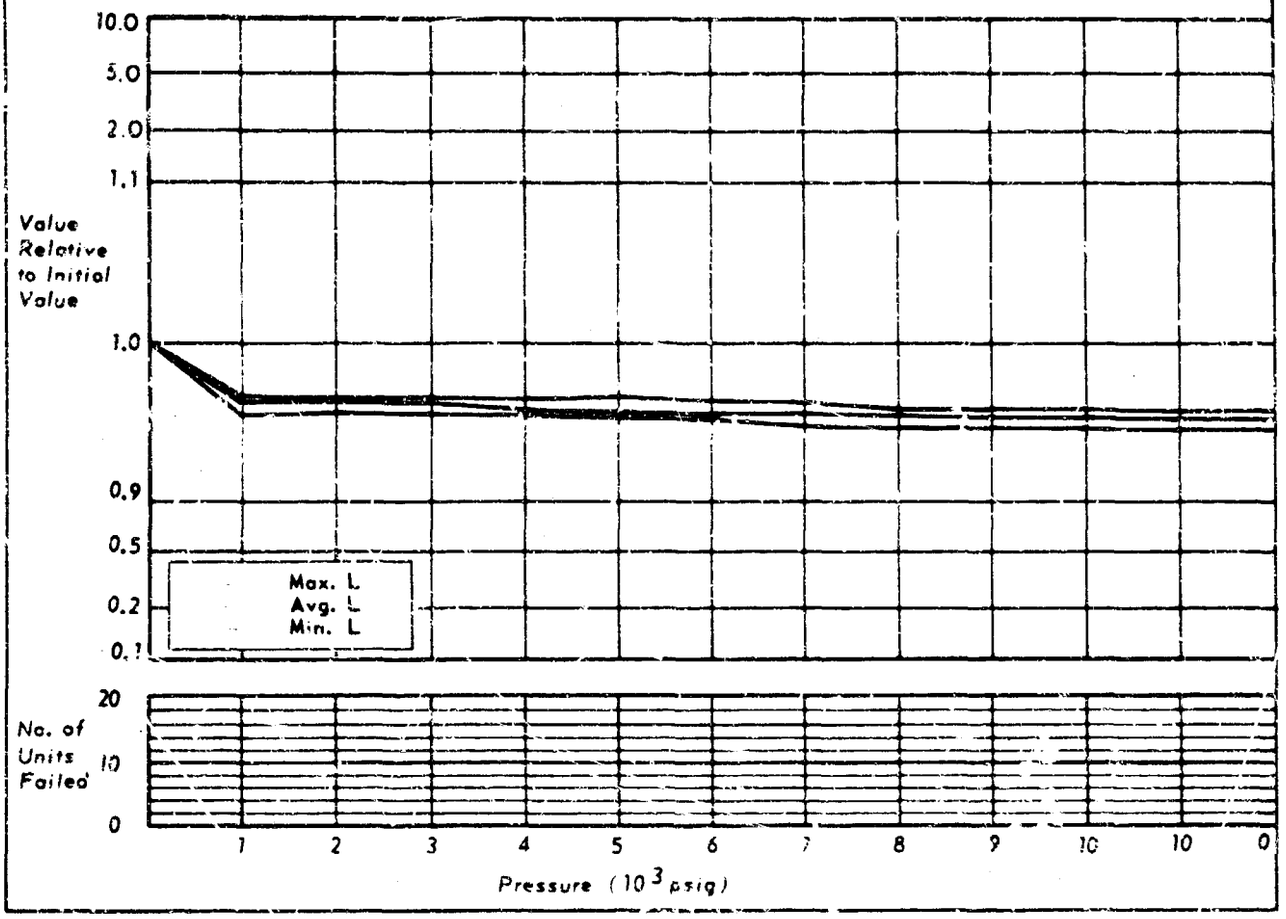
SOAK PERIOD: 16 hours at 8,000 psig.

MECHANICAL: No apparent damage.

FAILURE: The inductance varied more than 50% on one component at the pressures shown on graph on opposite page.

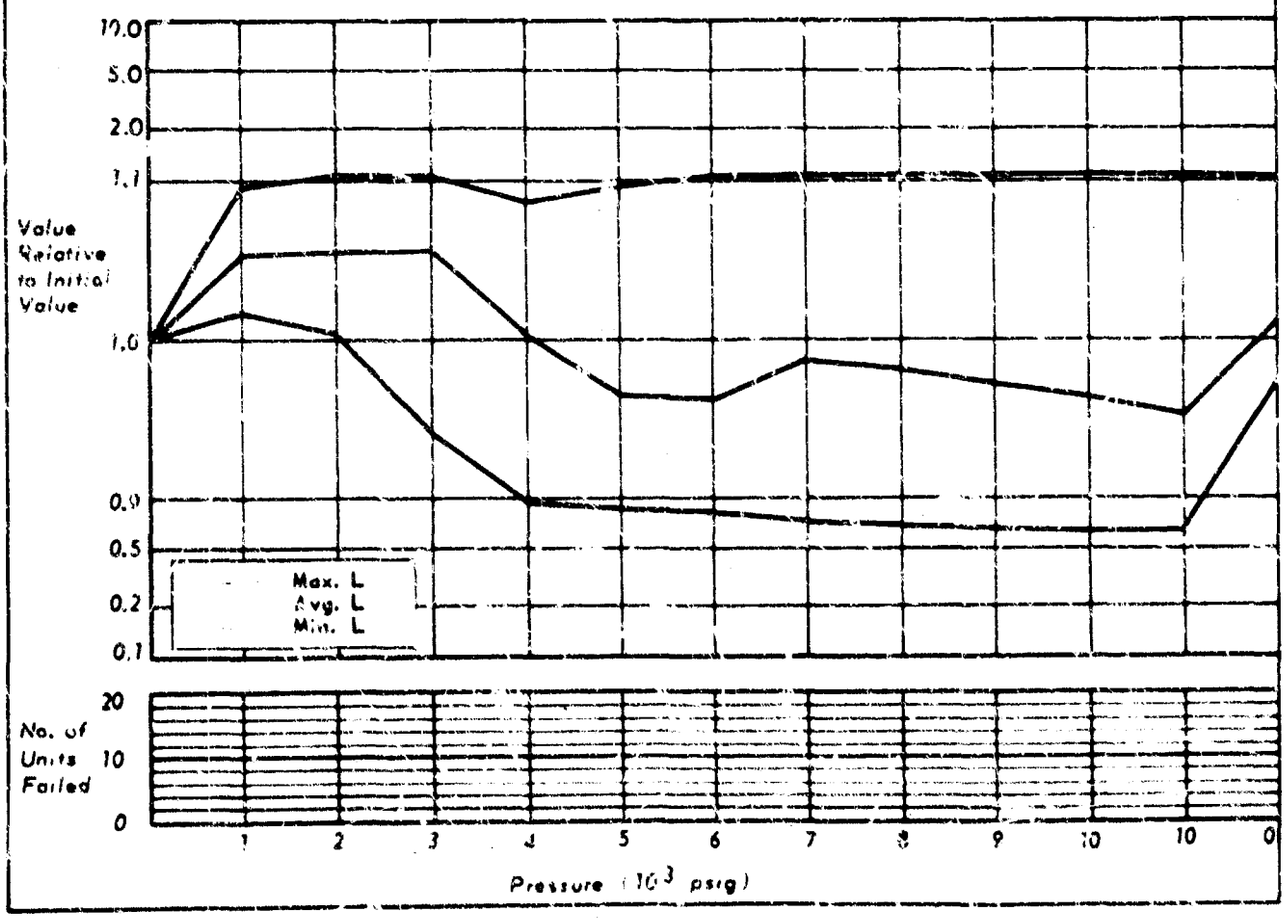
MFG. - J.W. MILLER
TYPE - RF CHOKE
DESCRIPTION - 9220-[illegible]

CHART NO. 65
NO. OF SAMPLES TESTED - [illegible]




MFG. - J.W. MILLER
TYPE - RF CHOKE
DESCRIPTION - 9240-756

CHART NO. 66
NO. OF SAMPLES TESTED - 17



| | | |
|---|---|---|
| J. W. Miller | 10,000 $\mu$H ± 5% | Molded |
| 9220-76 | at 0.25 Mc | Tubular, axial lead |
| R. F. choke | | 0.74 x 0.24" diam. |

SOAK PERIOD: 16 hours at 8,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| J. W. Miller | 10 $\mu$H ± 10% | Molded, shielded |
| 7240-756 | at 250 kc | Tubular, axial lead |
| R. F. choke | | 0.36 x 0.15" diam. |

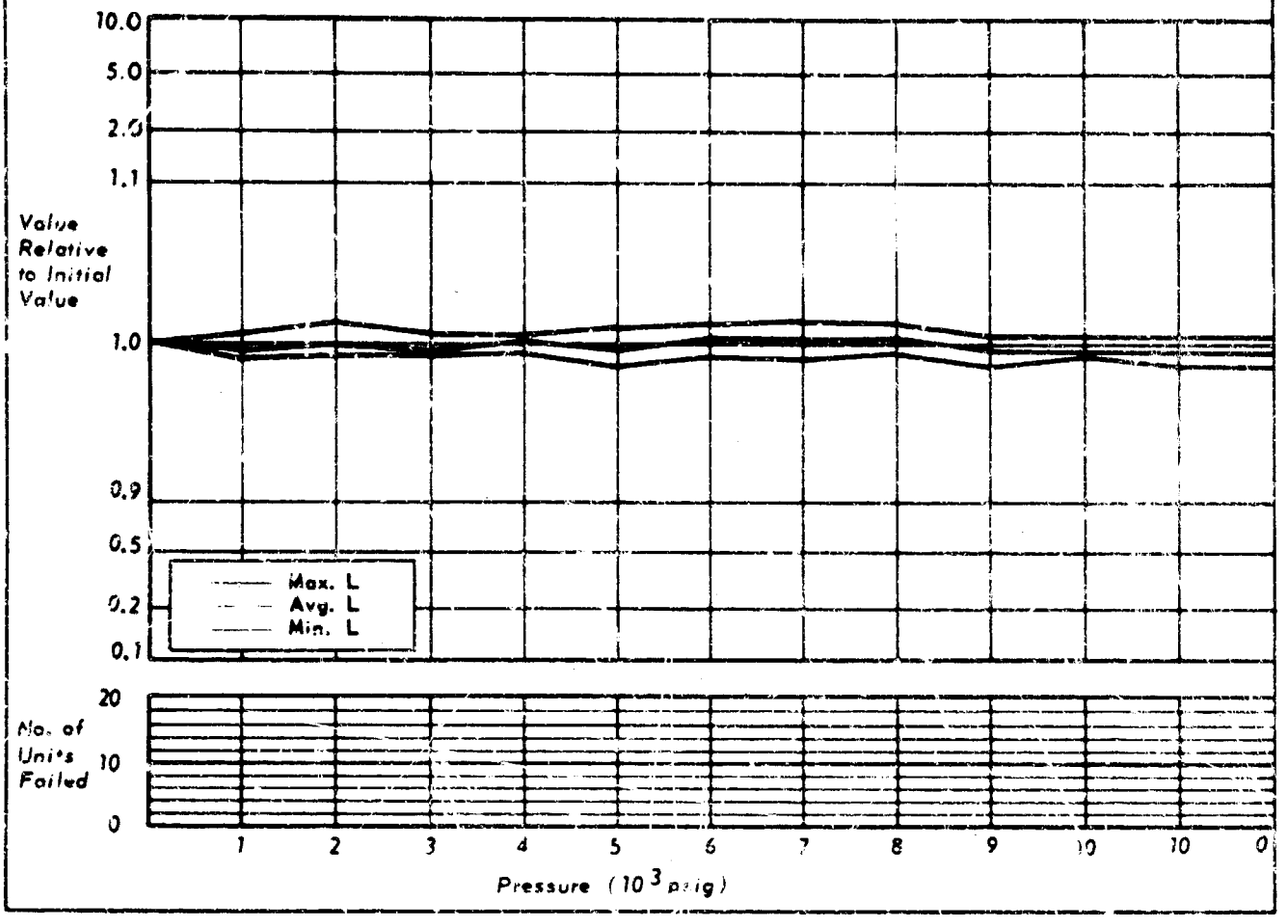
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: Nine components indicated less than 10% change.
Eight components indicated a change greater than 10% and less than 50%.

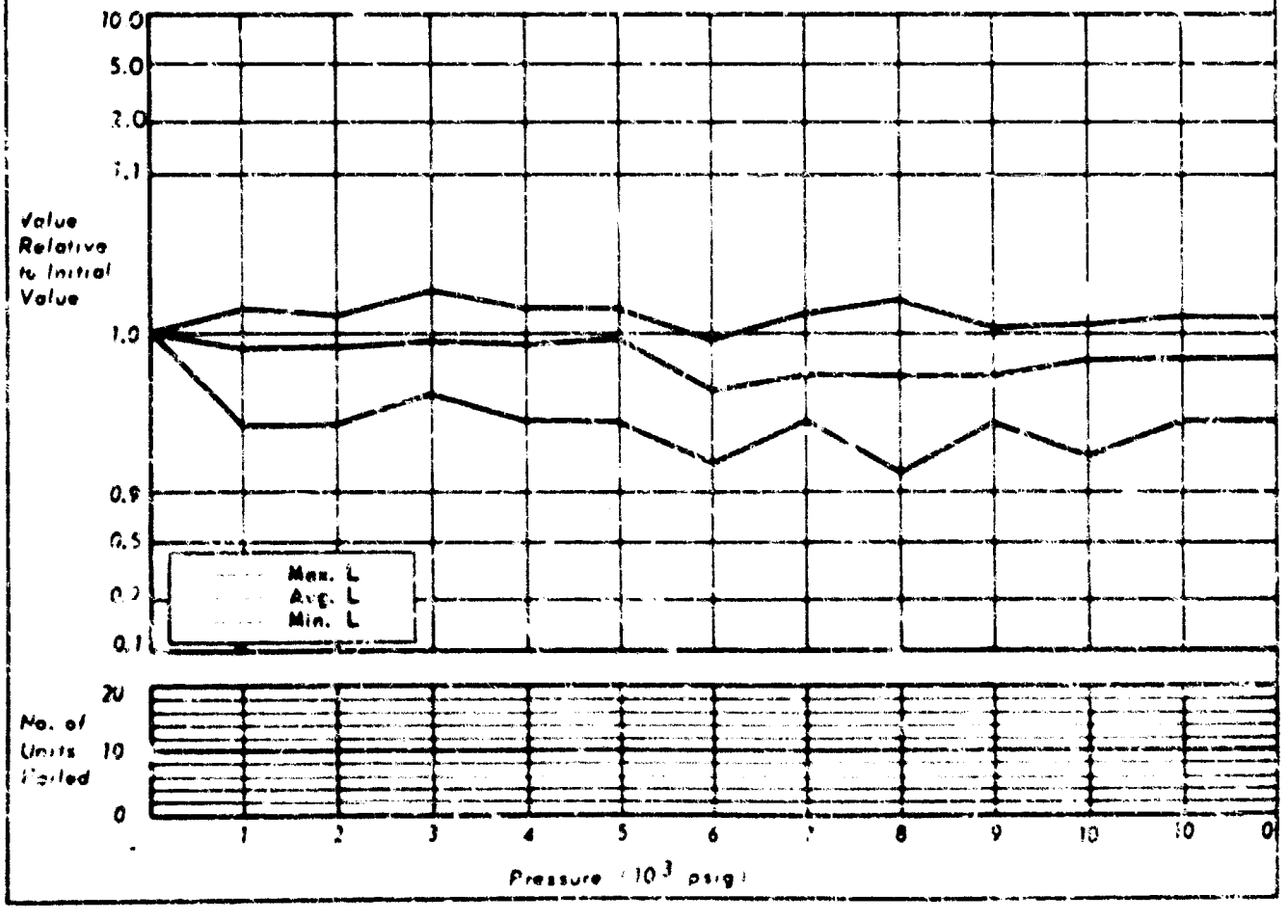
MFG.- J.W. MILLER
TYPE - RF COIL
DESCRIPTION - 50A 103 ZP1

CHART NO. 67
NO. OF SAMPLES TESTED - 19




MFG.- J.W. MILLER
TYPE - RF COIL
DESCRIPTION - 4632 - E

CHART NO. 68
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| J. W. Miller | 0.77 to 1.25 μH | Encap, adjustable |
| 50A 103 EBI | at 25 kc | Cylindrical, radial studs |
| R. F. coil | | 1.0 x 0.625" diam. |

SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| J. W. Miller | 300 μH | Encapsulated |
| 4632-E | at 2.5 Mc | Tubular, axial lead |
| R. F. coil | | 1.125 x 0.375" diam. |

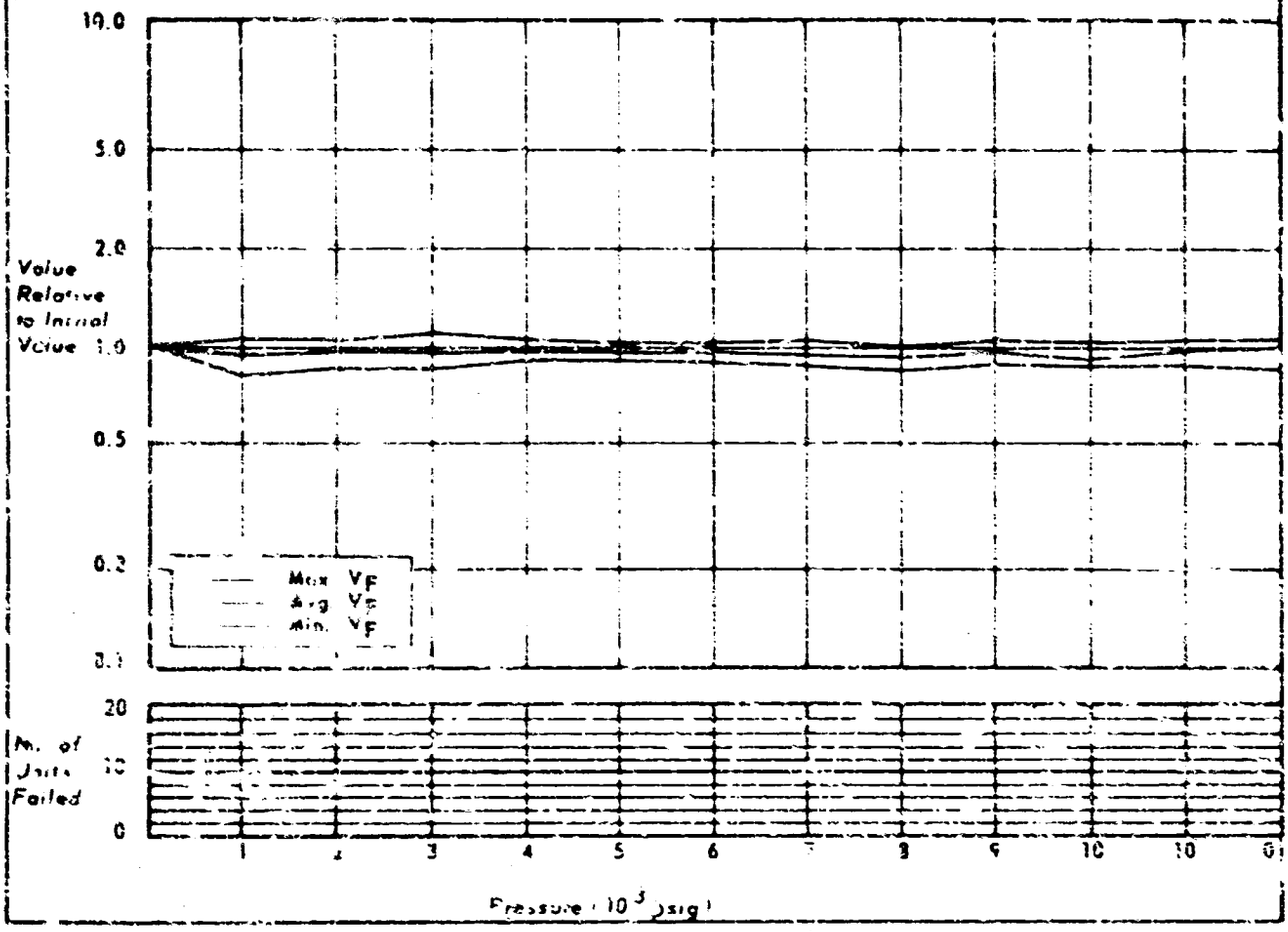
SOAK PERIOD: 16 hours at 8,000 psig.

MECHANICAL: Visual inspection after completion of test showed a small fracture in the molded case of one sample.

ELECTRICAL: All components indicated less than 10% change.

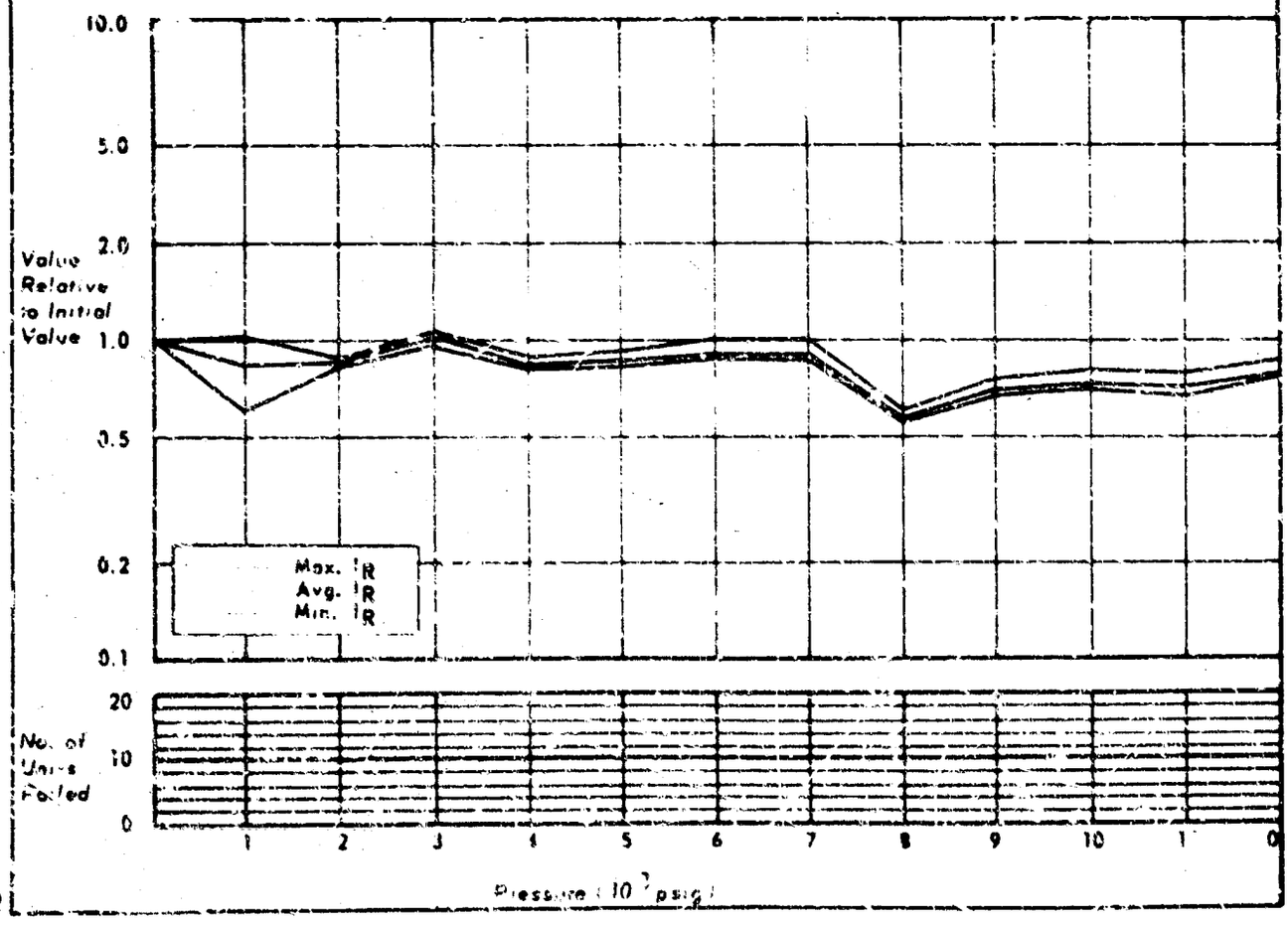
MFG. GENERAL INSTRUMENT
TYPE DIODE
DESCRIPTION 1N649

CHART NO. 69
NO. OF SAMPLES TESTED 19




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 69A
NO. OF SAMPLES TESTED



General Instruments
1N 649
Diode, rectifier

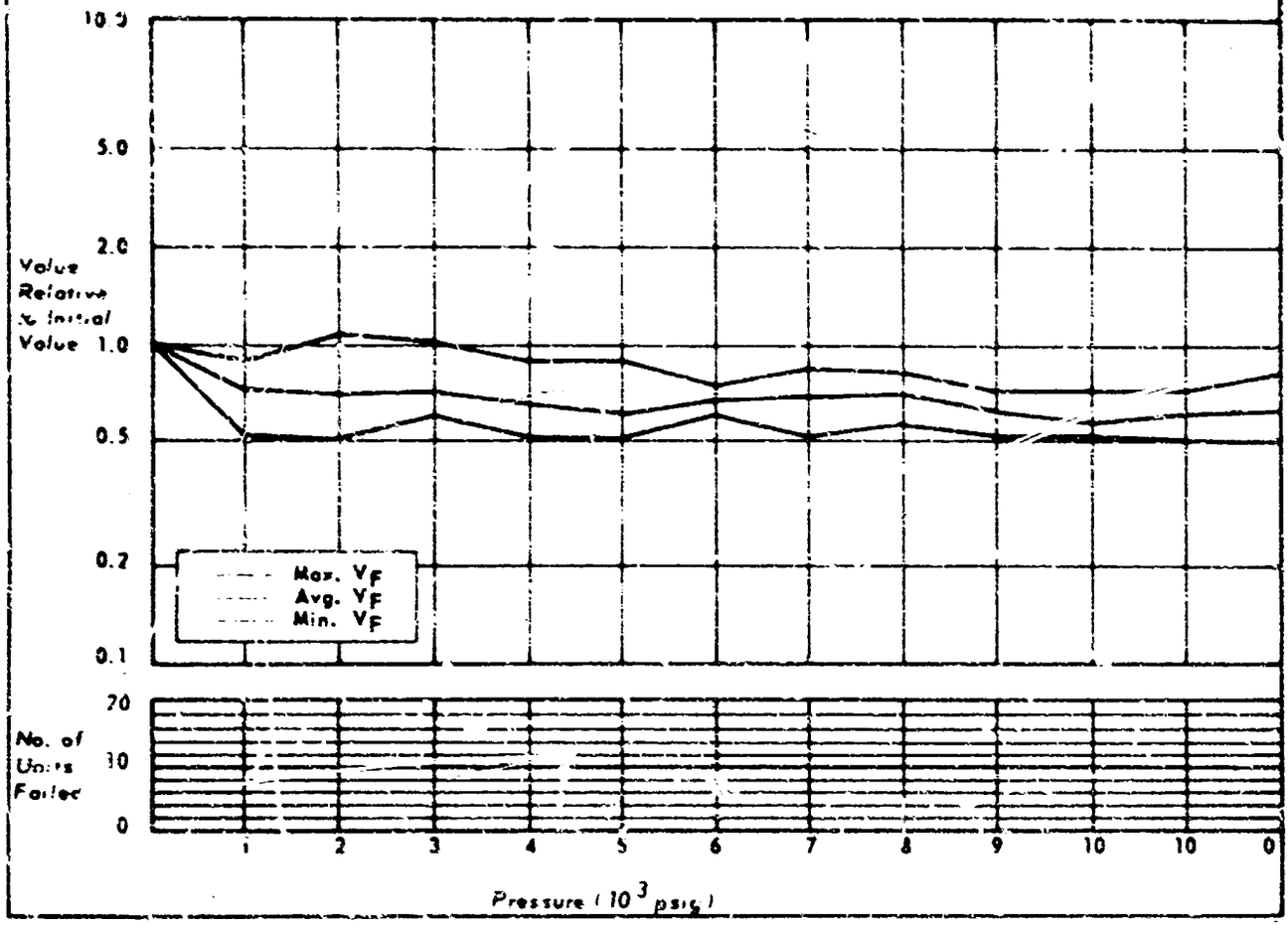
PIV = 600 V
$I_{dc\ avg.}$ = 400

Silicone, glass
Tubular, axial lead
2.30 x 0.095" diam.

SOAK PERIOD: 16 hours at 8,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

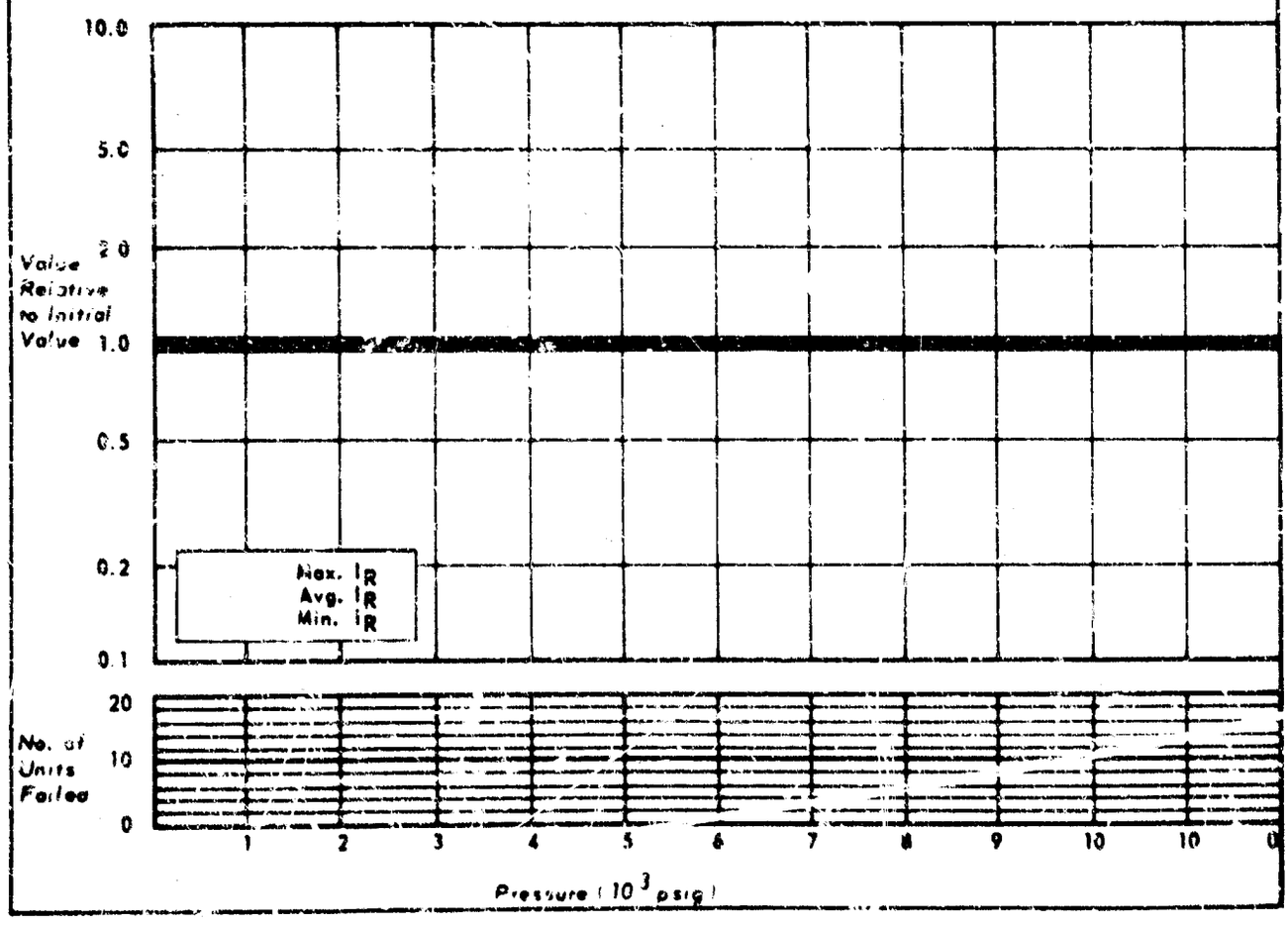
MFG.- GENERAL INSTRUMENT
TYPE - DIODE
DESCRIPTION - 1N3246

CHART NO. 70
NO. OF SAMPLES TESTED - 19




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 70A
NO. OF SAMPLES TESTED



General Instruments

1N 3666M2

Diode

PIV = 89 V dc

$I_{dc\ avg.}$ = 10 mA

Silicone

Glass case

0.36 x 0.15" diam.

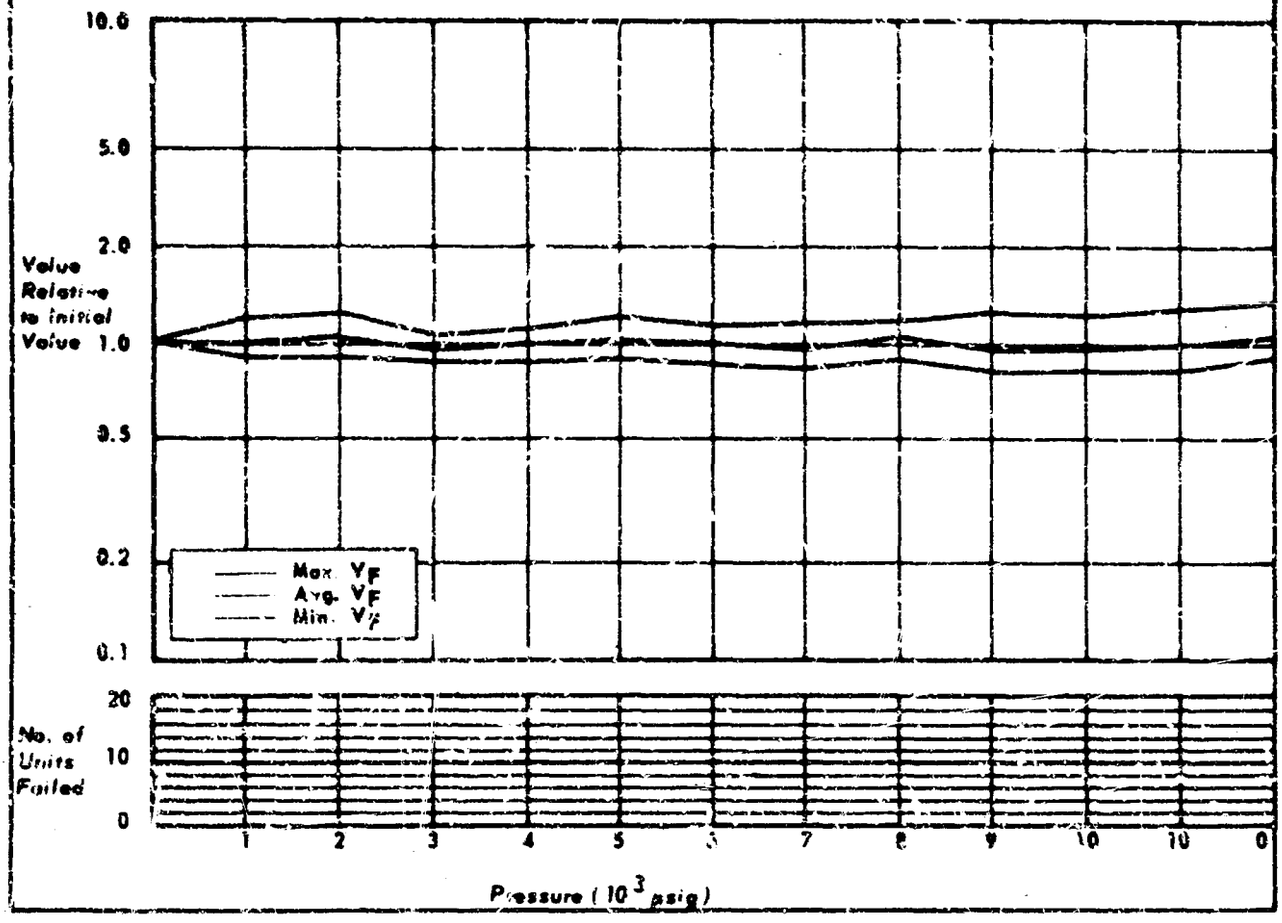
SOAK PERIOD: 1⁴ hours at 6000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: Two components indicated less than 10% change and seventeen indicated greater than 10% and less than 50% change.

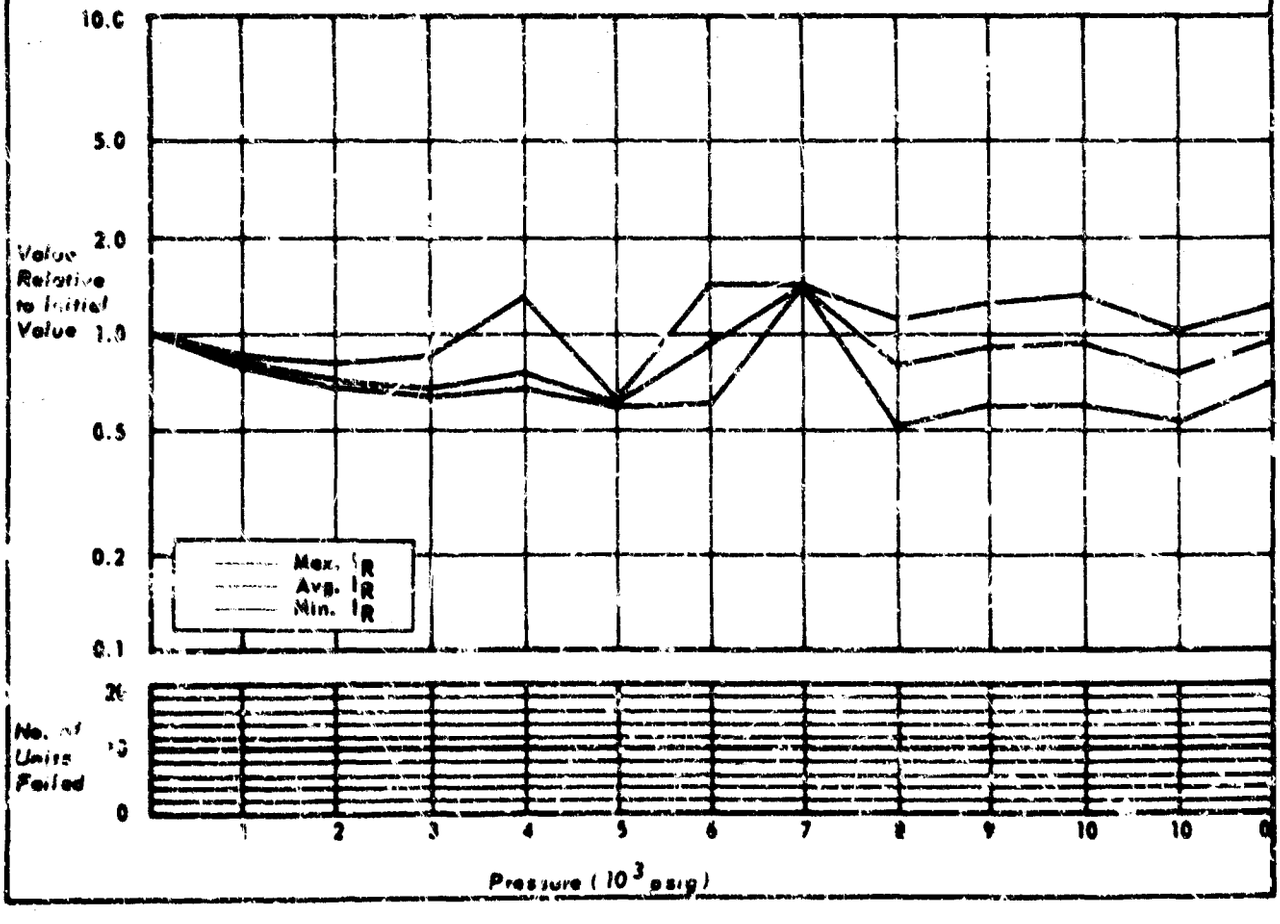
MFG. - GENERAL INSTRUMENT
TYPE - DIODE
DESCRIPTION 1N947

CHART NO. 71
NO. OF SAMPLES TESTED 20




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 71A
NO. OF SAMPLES TESTED



| | | |
|---|---|---|
| General Instruments | PIV = 600 V | Silicone |
| 1N 547 | $I_{dc\ avg.}$ = 250 mA | DO case |
| Diode, rectifier | | 0.90 x 0.40" diam |

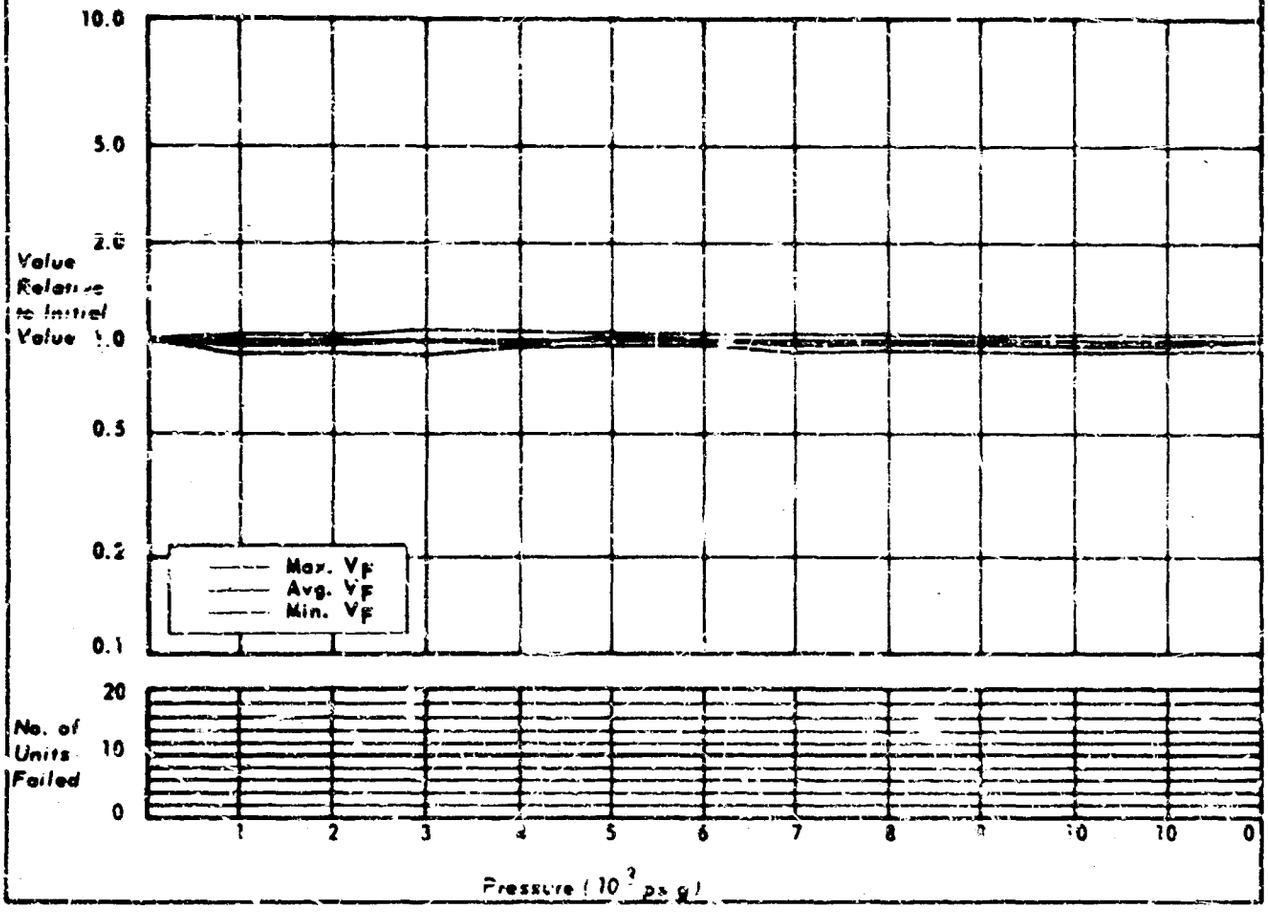
SOAK PERIOD: 16 hours at 10,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

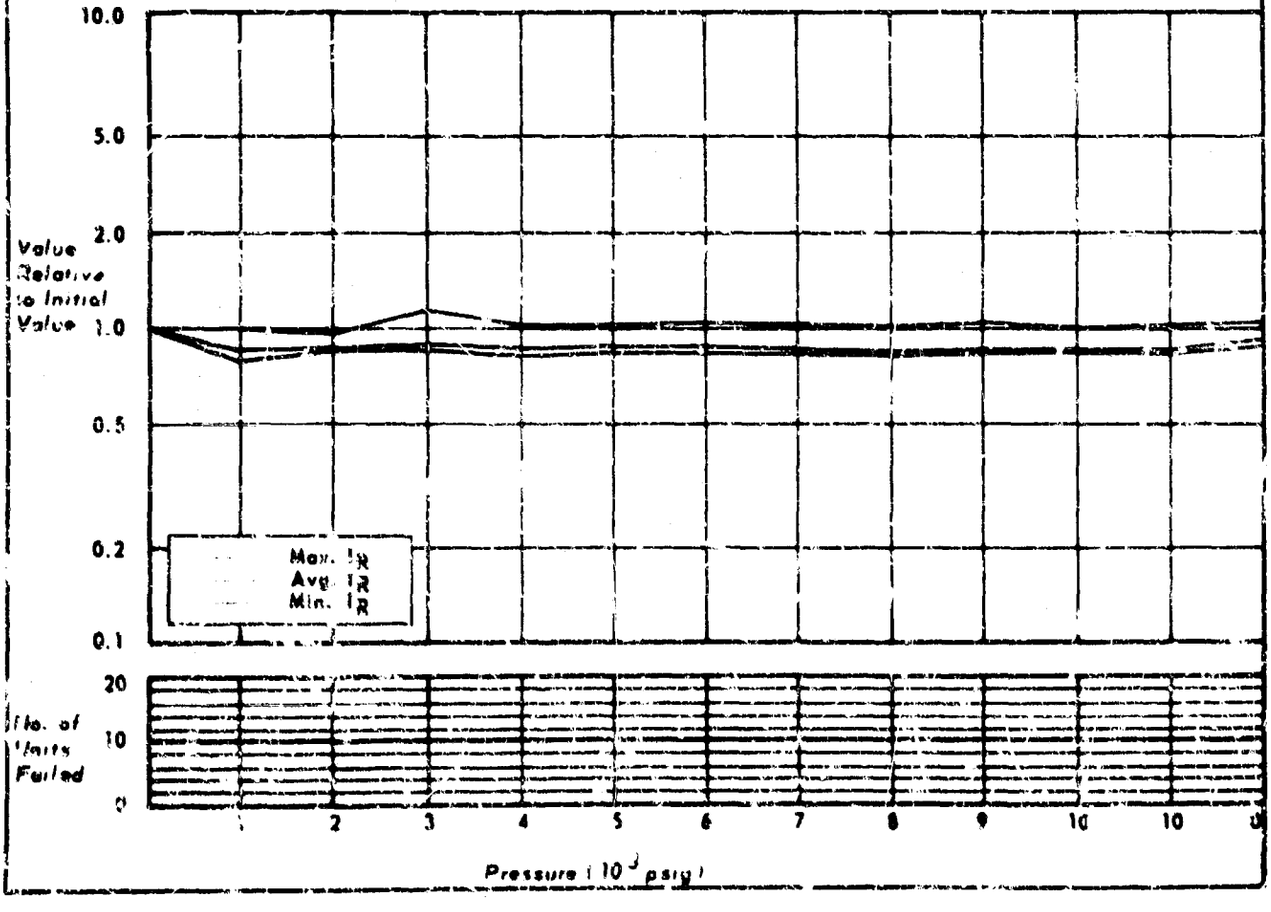
MFG. - GENERAL INSTRUMENT
TYPE - DIODE
DESCRIPTION - 1N1206A

CHART NO. 72
NO. OF SAMPLES TESTED - 20




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 72A
NO. OF SAMPLES TESTED



General Instruments
1N 1206A
Diode, rectifier

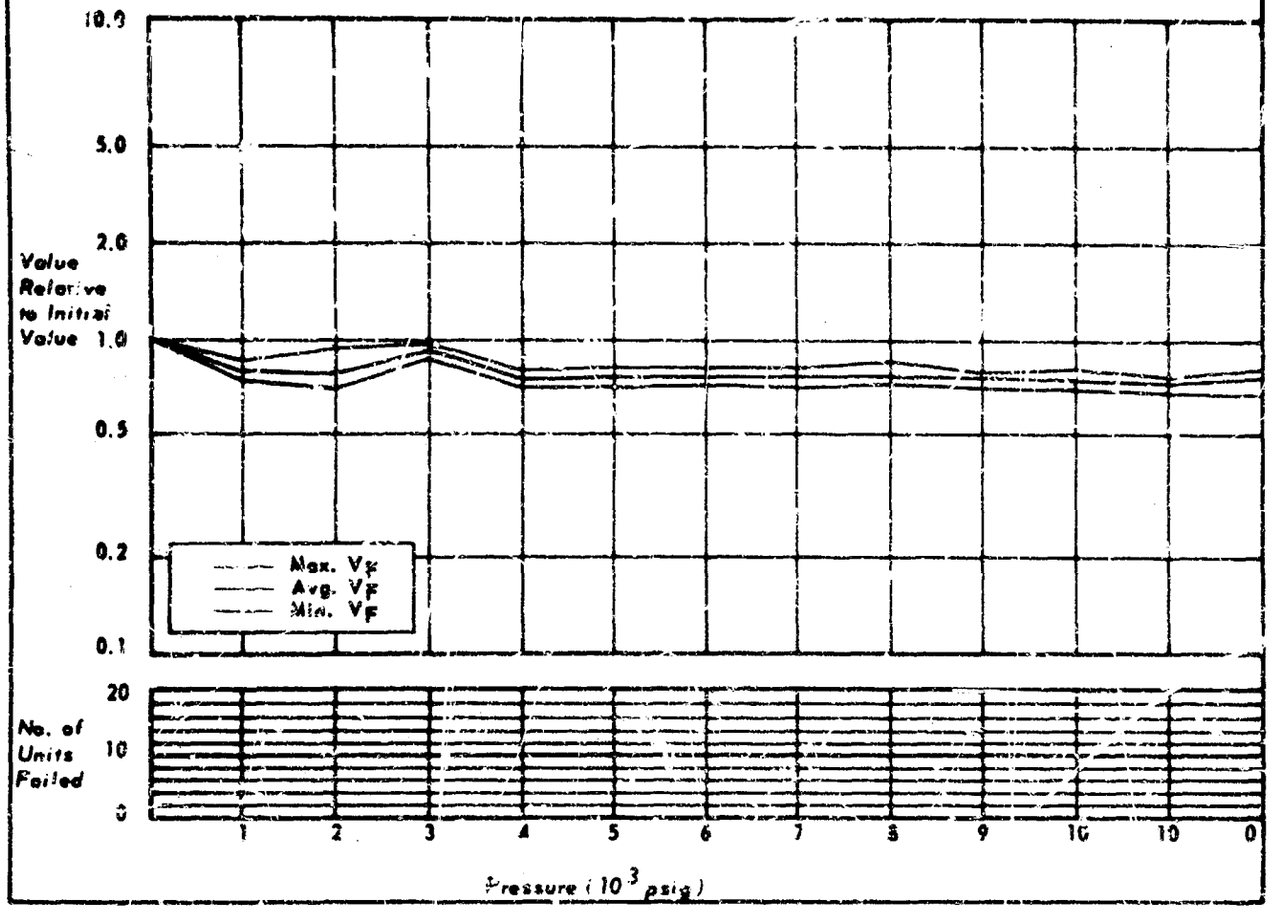
PIV = 50-600 V
$I_{dc\ avg.}$ = 6 Amp

Silicone
DO case
Stud mount
0.40 x 0.40" diam

SOAK PERIOD: None
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

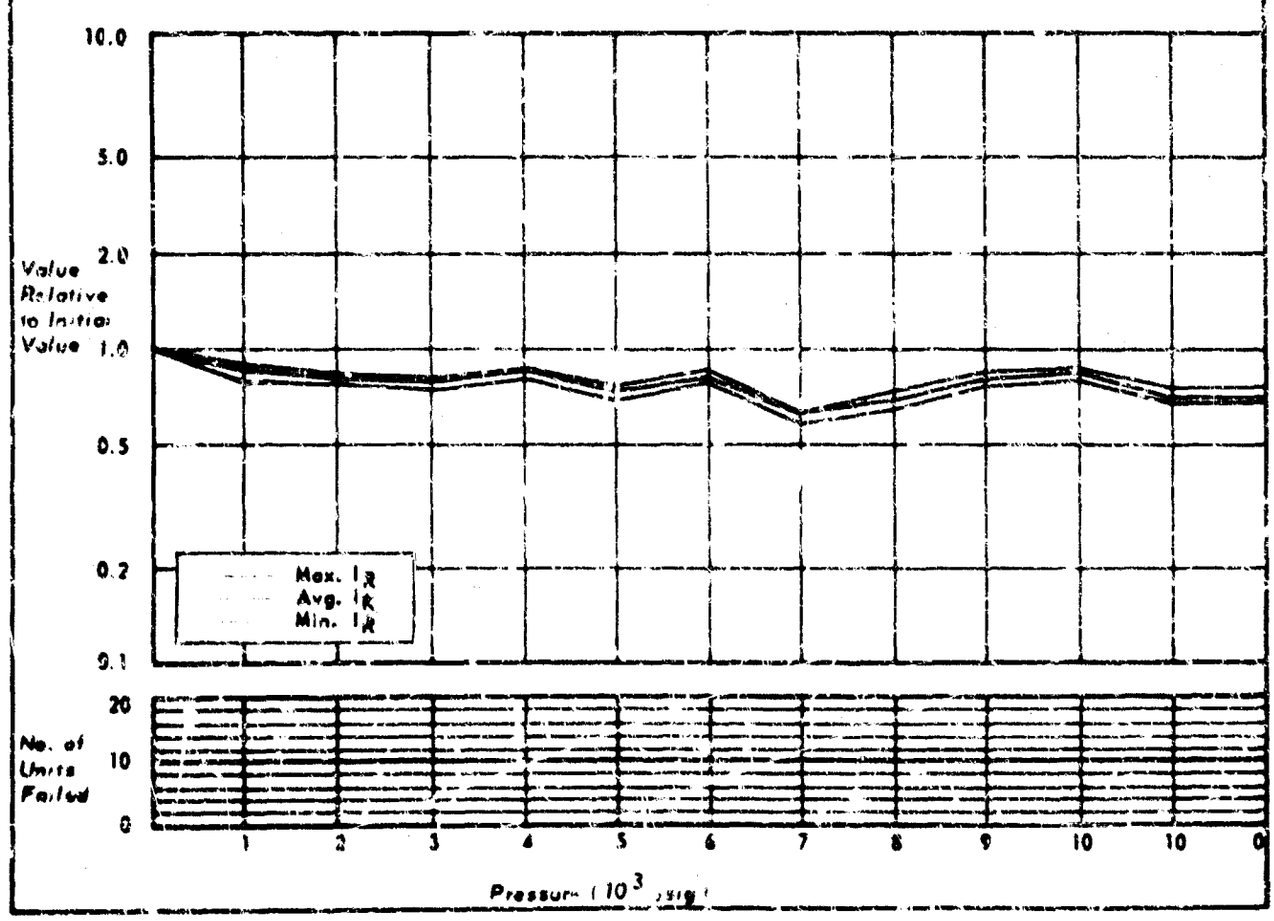
MFG. GENERAL INSTRUMENT
TYPE - DIODE, RECTIFIER
DESCRIPTION - 6100J

CHART NO. 73
NO. OF SAMPLES TESTED - 20




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 73A
NO. OF SAMPLES TESTED



General Instruments
G 100 J
Diode, rectifier

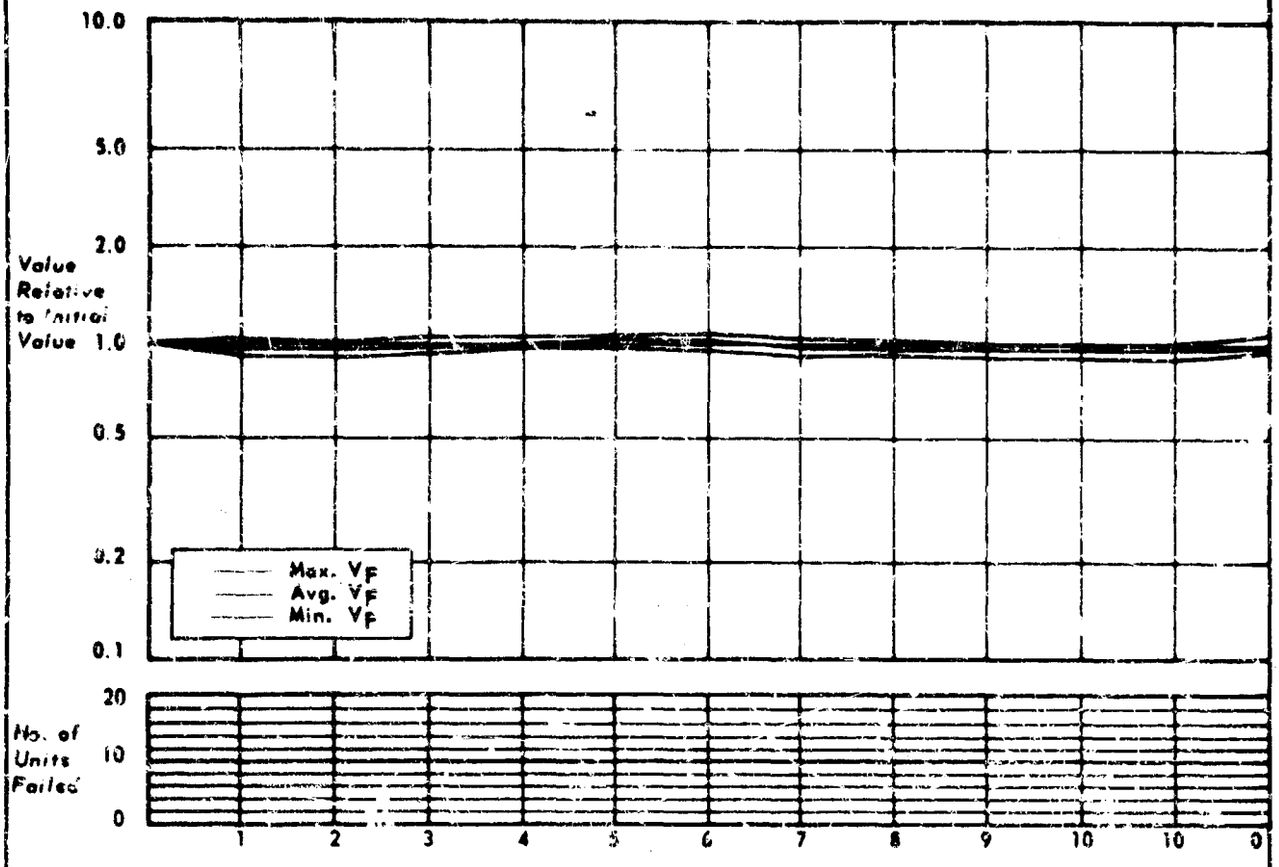
PIV = 600 V
$I_{dc\ avg.}$ = 1.0 Amp

Silicone
Lead mount
Glass encap
0.36 x 0.15" diam

SOAK PERIOD: 16 hours at 10,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated a change greater than 10% and less than 50%.

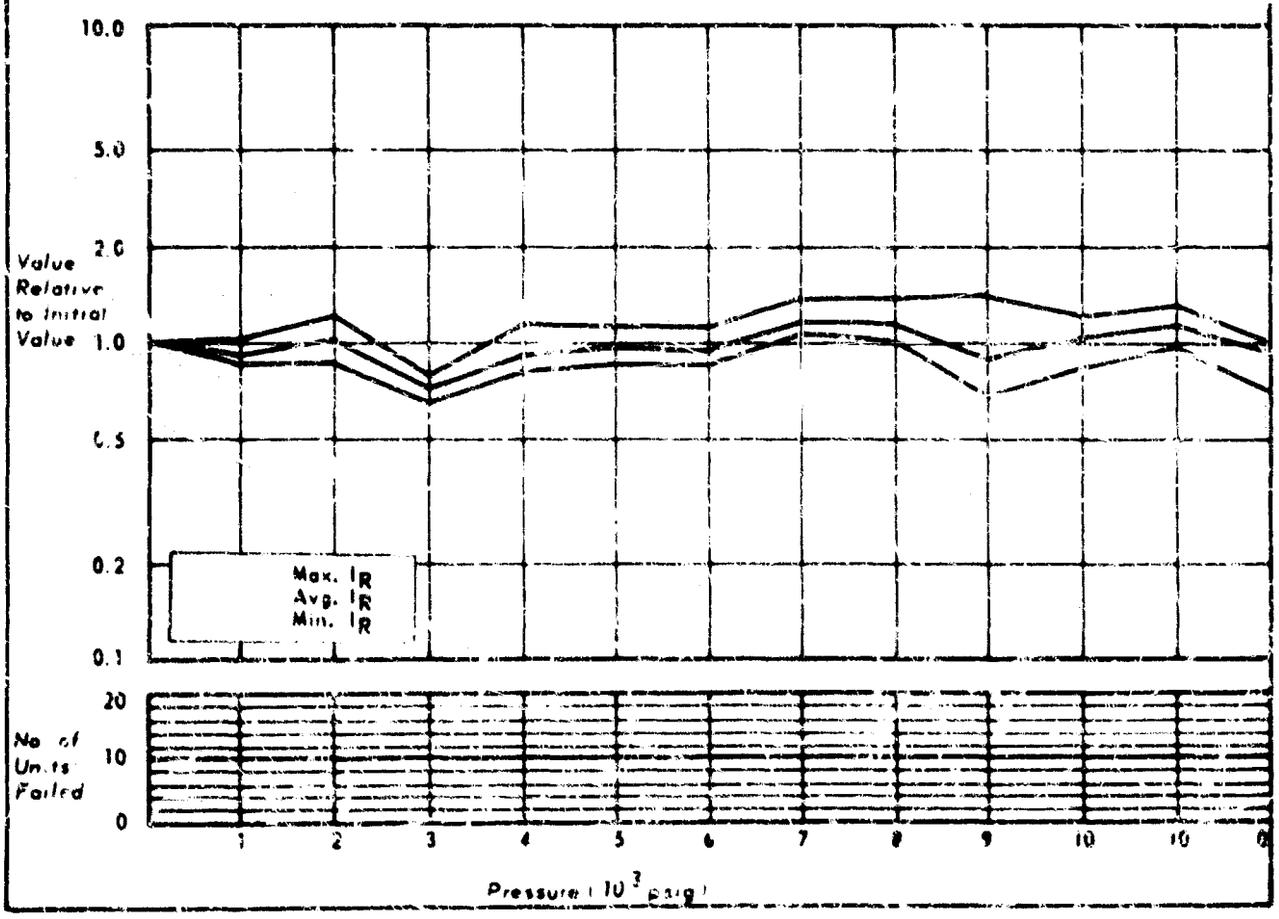
MFG. - MOTOROLA
TYPE - DIODE, RECTIFIER
DESCRIPTION - 1N3191

CHART NO. 74
NO. OF SAMPLES TESTED - 19




MFG.
TYPE
DESCRIPTION - (SAME AS ABOVE)

CHART NO. 74A
NO. OF SAMPLES TESTED



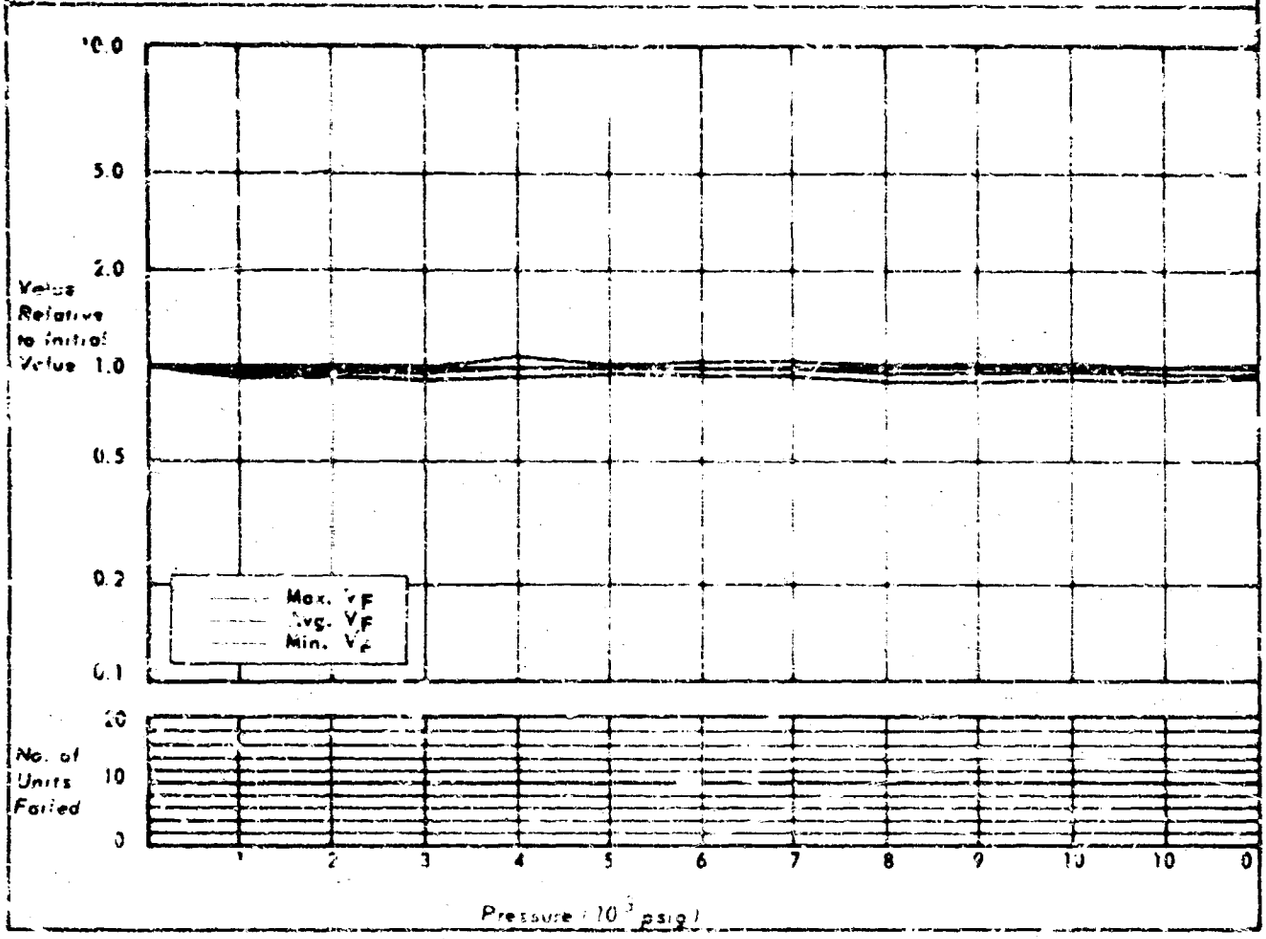
Motorola
1N 3191
Diode, rectifier

Herm sealed steel case
Tubular, axial lead
0.32 x 0.22" diam

SOAK PERIOD: 16 hours at 3,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

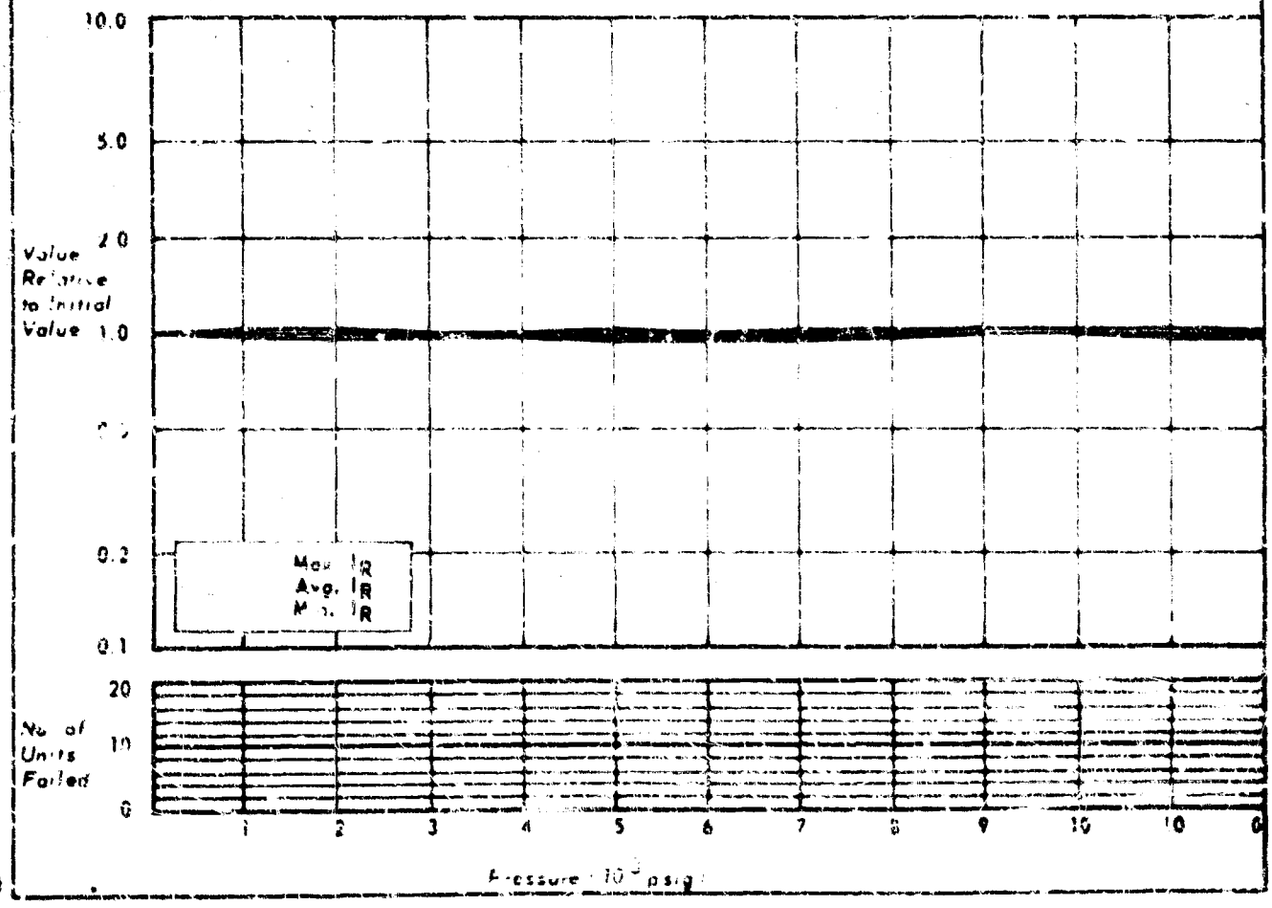
MFG: MOTOROLA
TYPE: DIODE, RECTIFIER
DESCRIPTION: 1N5005

CHART NO. 75
NO. OF SAMPLES TESTED: 20




MFG:
TYPE:
DESCRIPTION (SAME AS ABOVE)

CHART NO. 75A
NO. OF SAMPLES TESTED



Motorola
1N 4005
Diode, rectifier

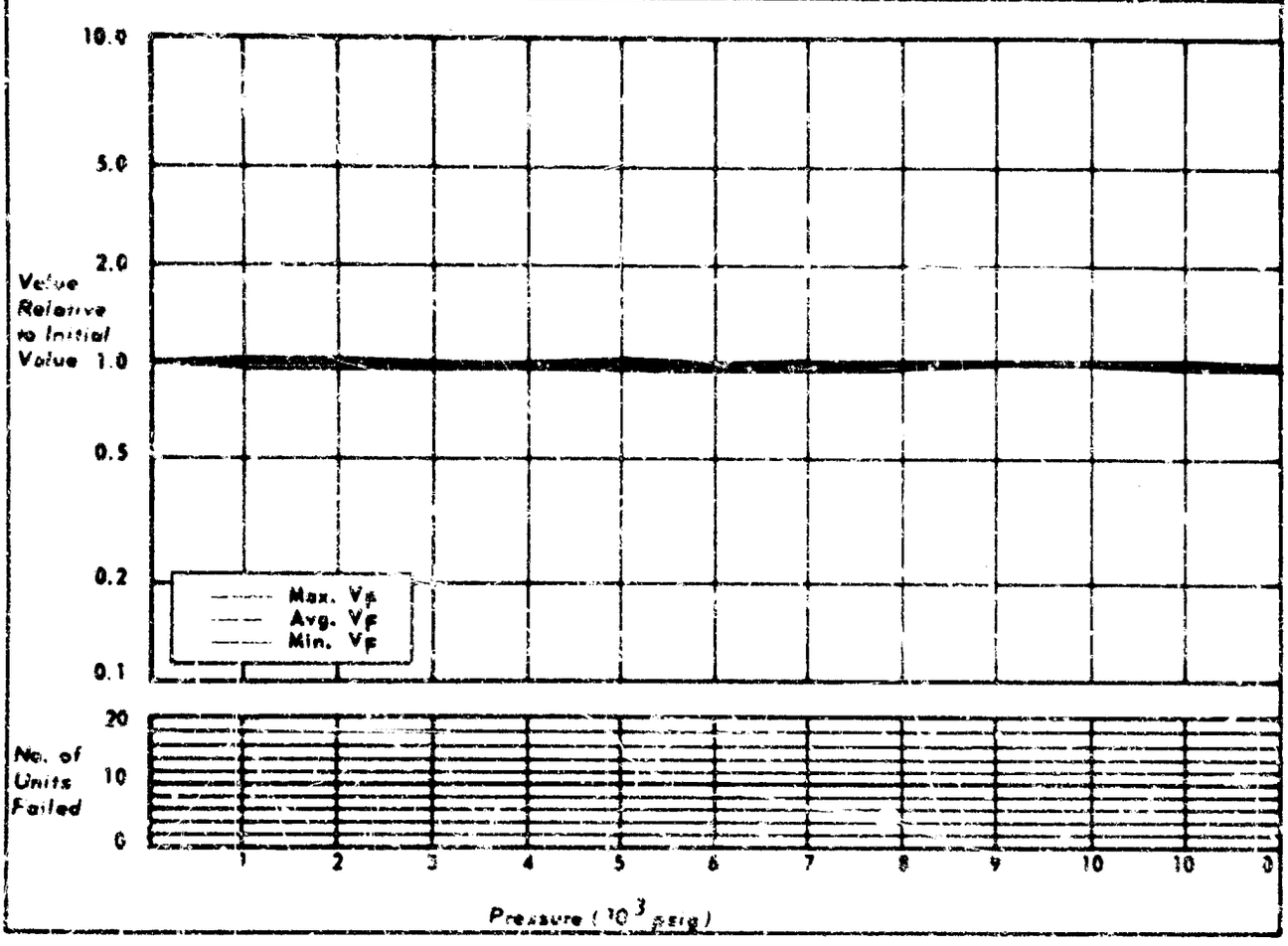
PIV = 600 V
$I_{dc\ avg.}$ = 1 Amp

Plastic encap
Passivated
Tubular, axial lead
0.18 x 0.1" diam

SOAK PERIOD: None
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

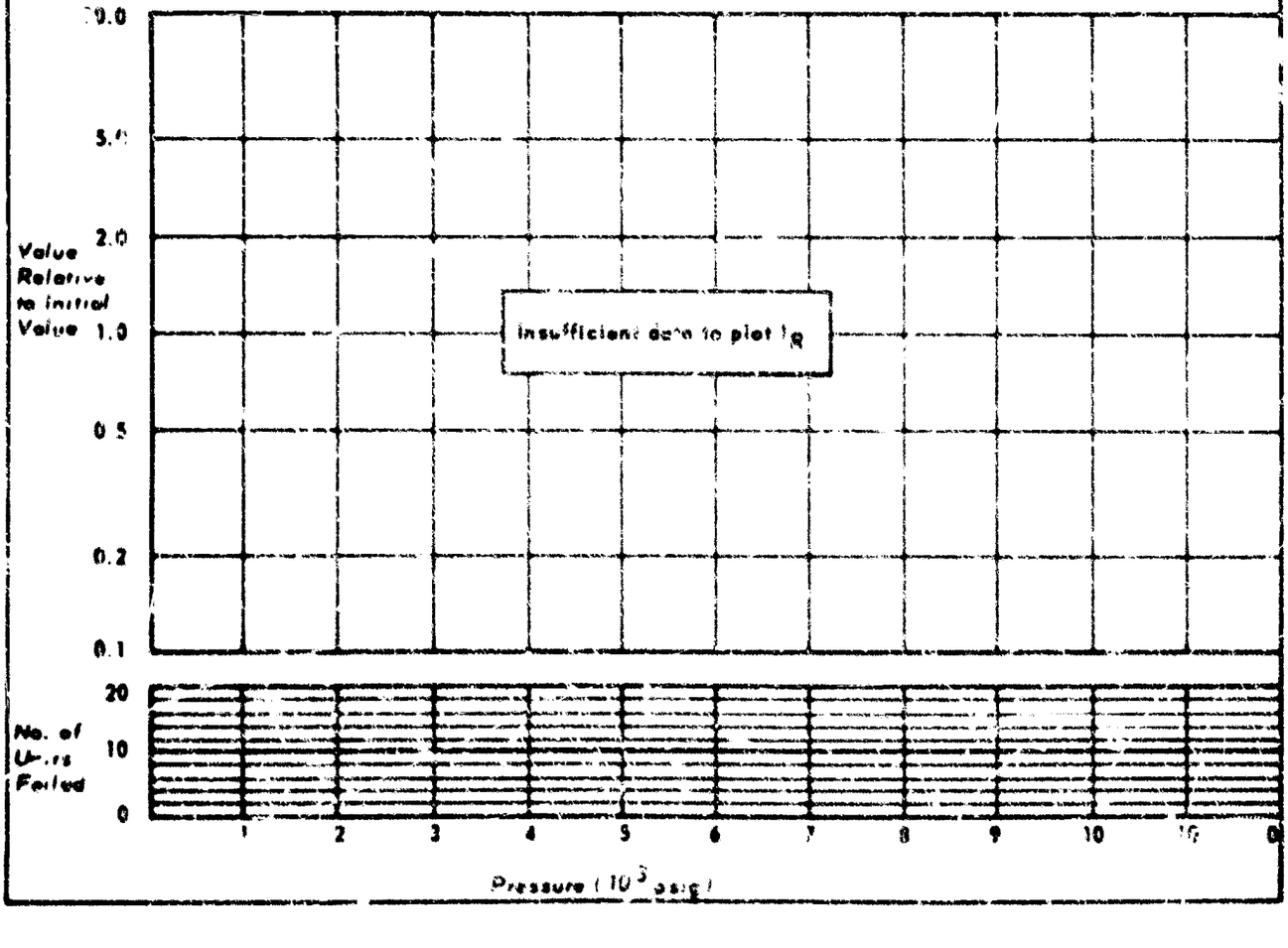
MFG. - MOTOROLA
TYPE - DIODE
DESCRIPTION - 1N5085

CHART NO. 76
NO. OF SAMPLES TESTED - 20




MFG.
TYPE
DESCRIPTION

CHART NO. 76A
NO. OF SAMPLES TESTED



| | | |
|---|---|---|
| Motorola | $V_Z$ = 91 V | Hermetically sealed metal case |
| 1N 3043B | $I_{ZT}$ = 2.8 mA | Tubular, axial lead |
| Diode, zener | | 0.31" x 0.22" diam |

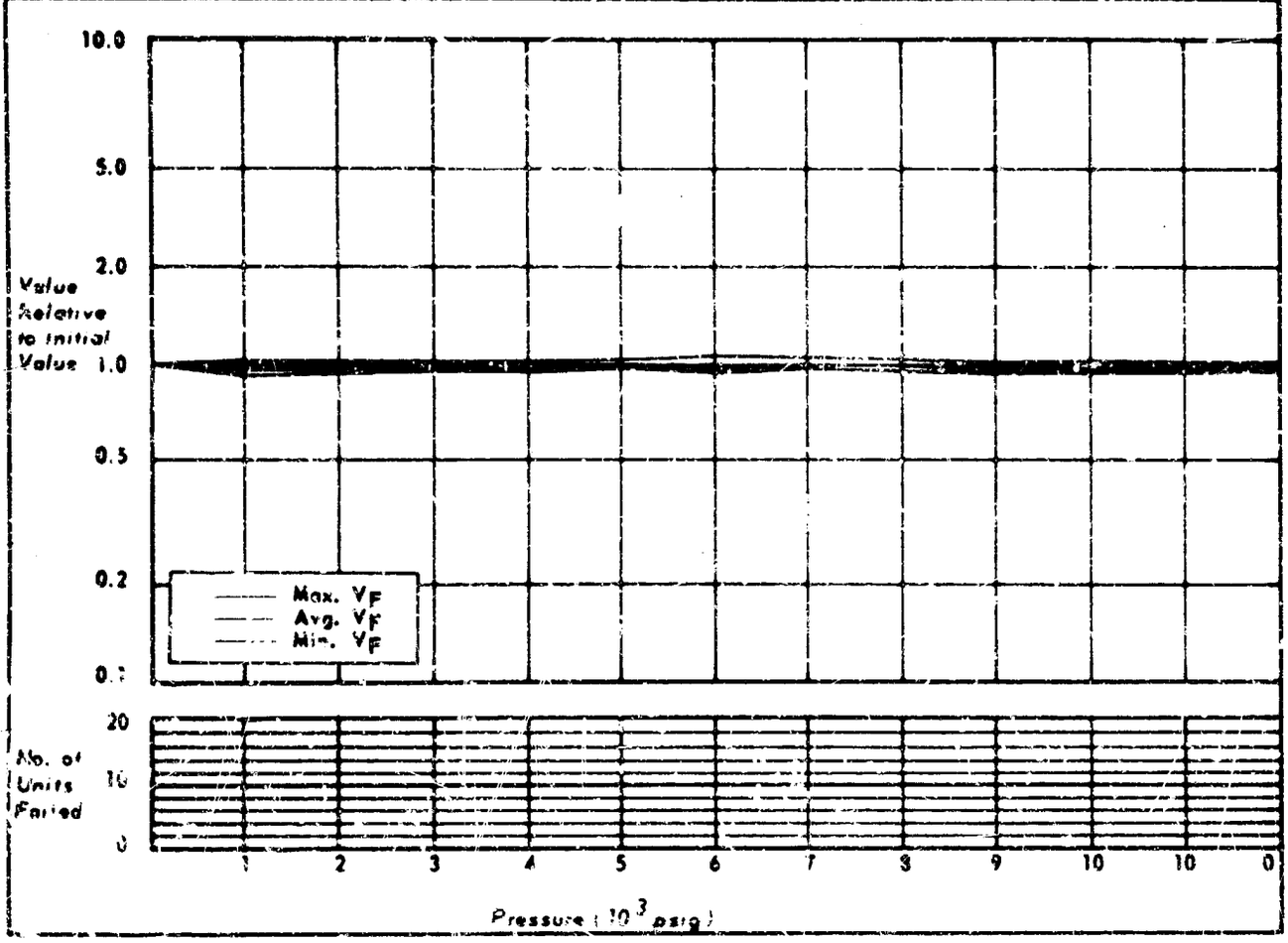
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

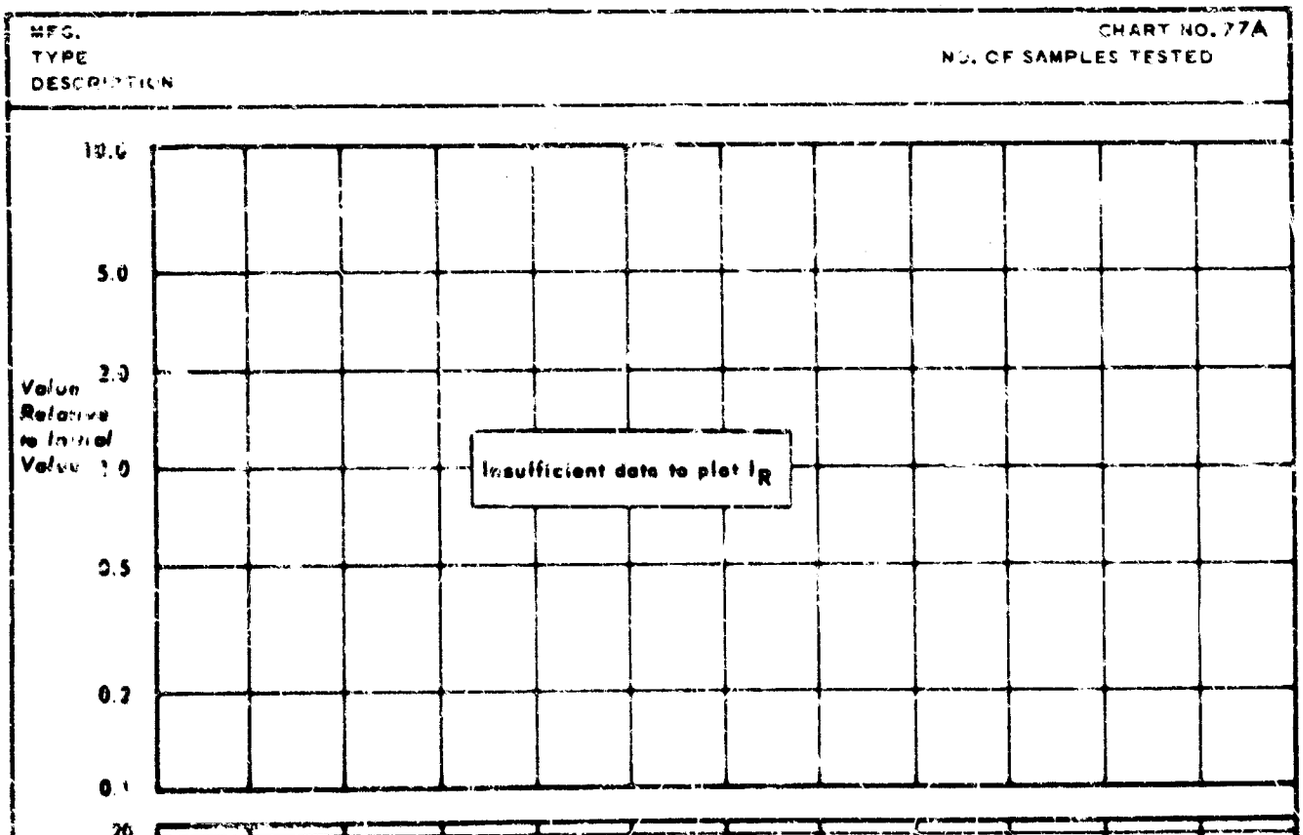
MFG. - MOTOROLA
TYPE - DIODE, ZENER
DESCRIPTION - 400 MW

CHART NO. 77
NO. OF SAMPLES TESTED - 18




MFG.
TYPE
DESCRIPTION

CHART NO. 77A
NO. OF SAMPLES TESTED



Motorola | See Note #1 | Glass, molded

Type 400, See note | Tubular, axial lead

Diodes, zeners | 0.24 x 0.08" diam

**SOAK PERIOD:** 16 hours @ 10,000 psig.

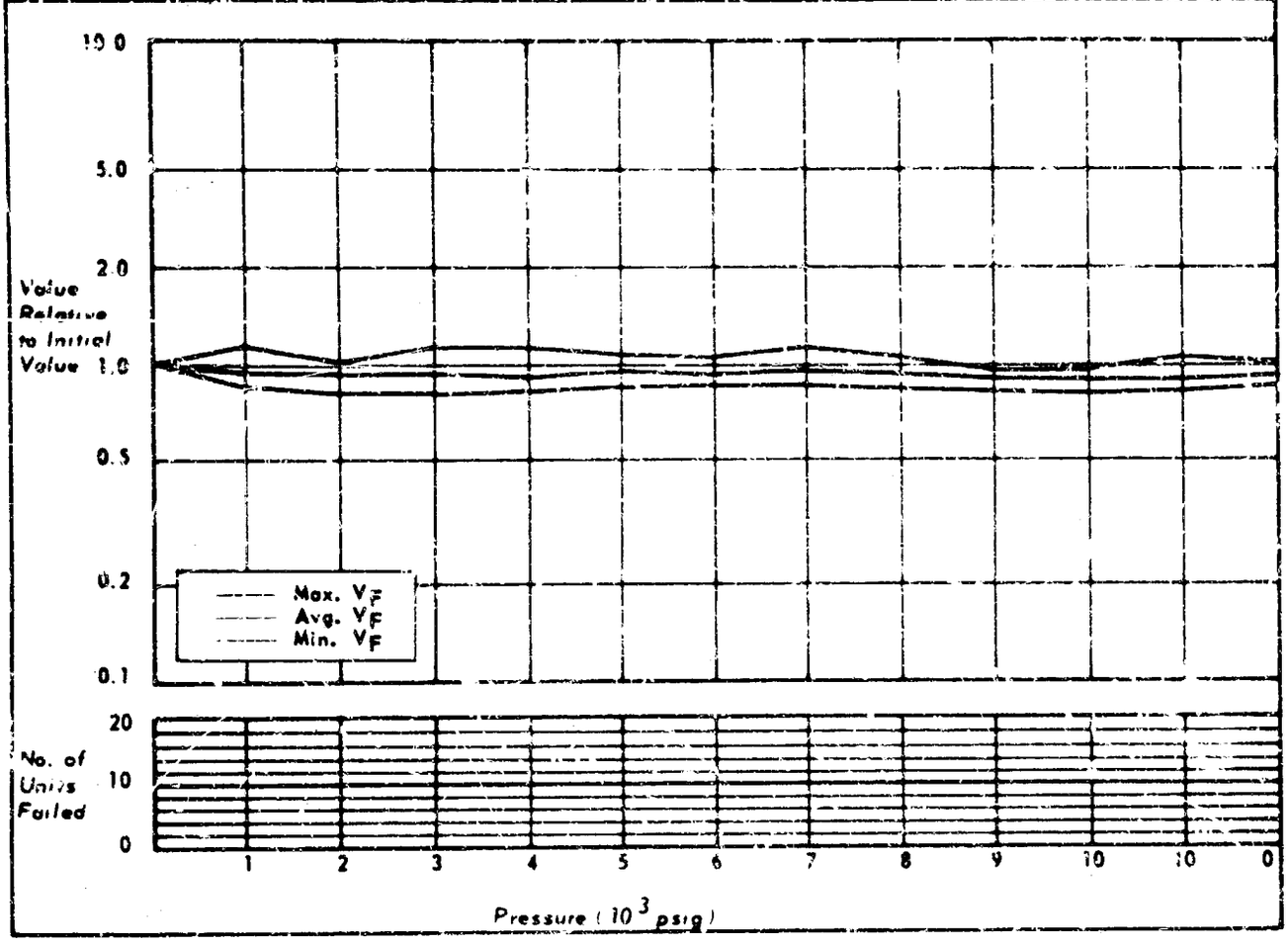
**MECHANICAL:** No apparent damage.

**NOTE #1:** Twenty components, two each of ten various values were submitted. Since all components were of the same type the set of twenty was tested and the results of the set graphed. The part numbers, description and components failed are listed below.

| Part No. | PIV | $I_{dc}$ avg. | No. failed | Part No. | PIV | $I_{dc}$ avg. | No. failed |
|---|---|---|---|---|---|---|---|
| 1N 746A | 3.3 V | 20 mA | 0 | 1N 962A | 11.0 V | 11.5 mA | 0 |
| 1N 749A | 4.3 V | 20 mA | 0 | 1N 966B | 16.0 V | 7.8 mA | 0 |
| 1N 741A | 5.1 V | 20 mA | 0 | 1N 969B | 22.0 V | 5.6 mA | 0 |
| 1N 755A | 7.5 V | 20 mA | 0 | 1N 975B | 36.0 V | 3.2 mA | 0 |
| 1N 759A | 12.0 V | 20 mA | 0 | 1N 989B | 91.0 V | 1.4 mA | 2 |

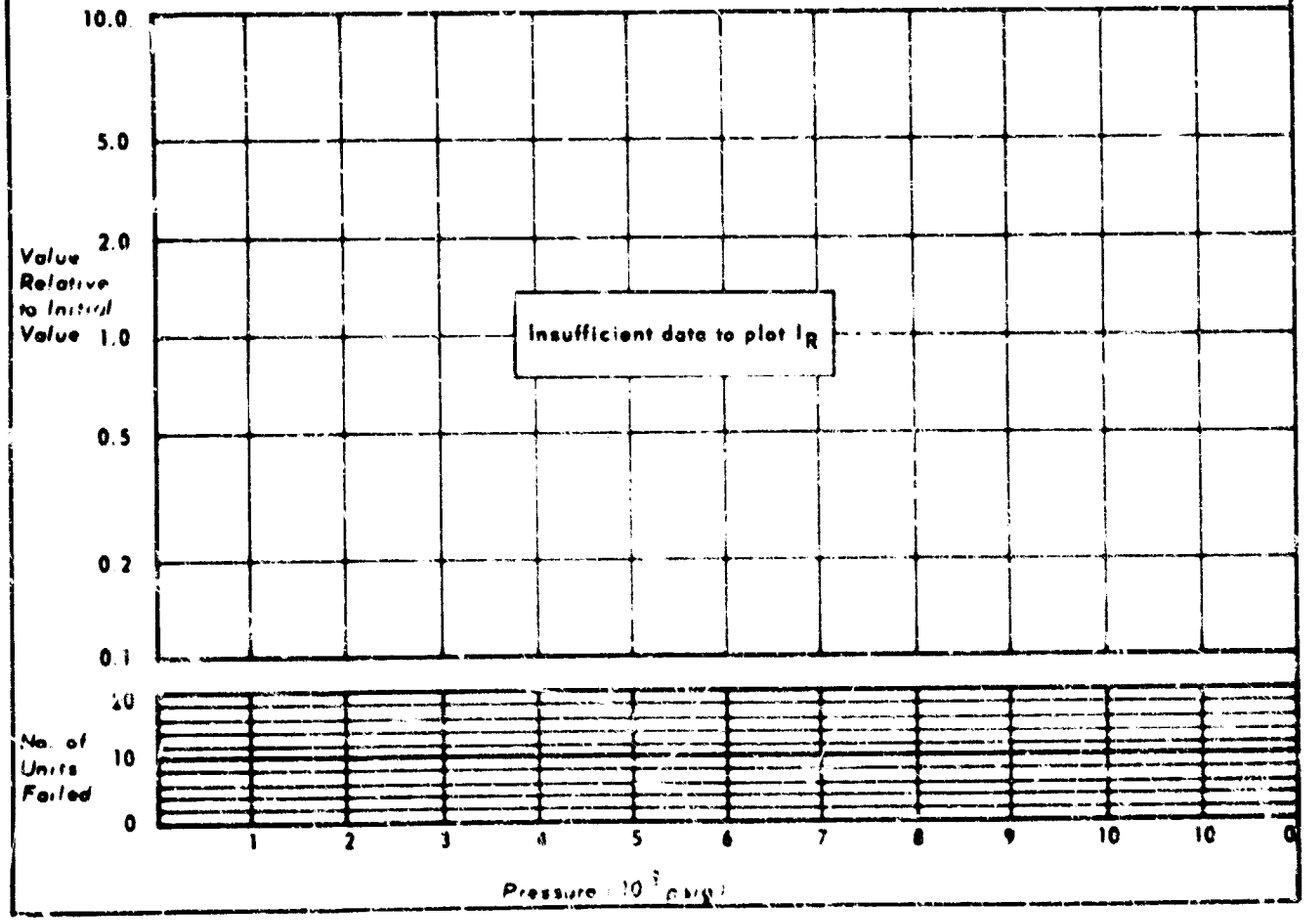
MFG. - CHMITE
TYPE - SILICON DIODE
DESCRIPTION - (NONE AVAILABLE)

CHART NO. 78
NO. OF SAMPLES TESTED - 20




MFG.
TYPE
DESCRIPTION

CHART NO. 78A
NO. OF SAMPLES TESTED



Ohmite

Diode

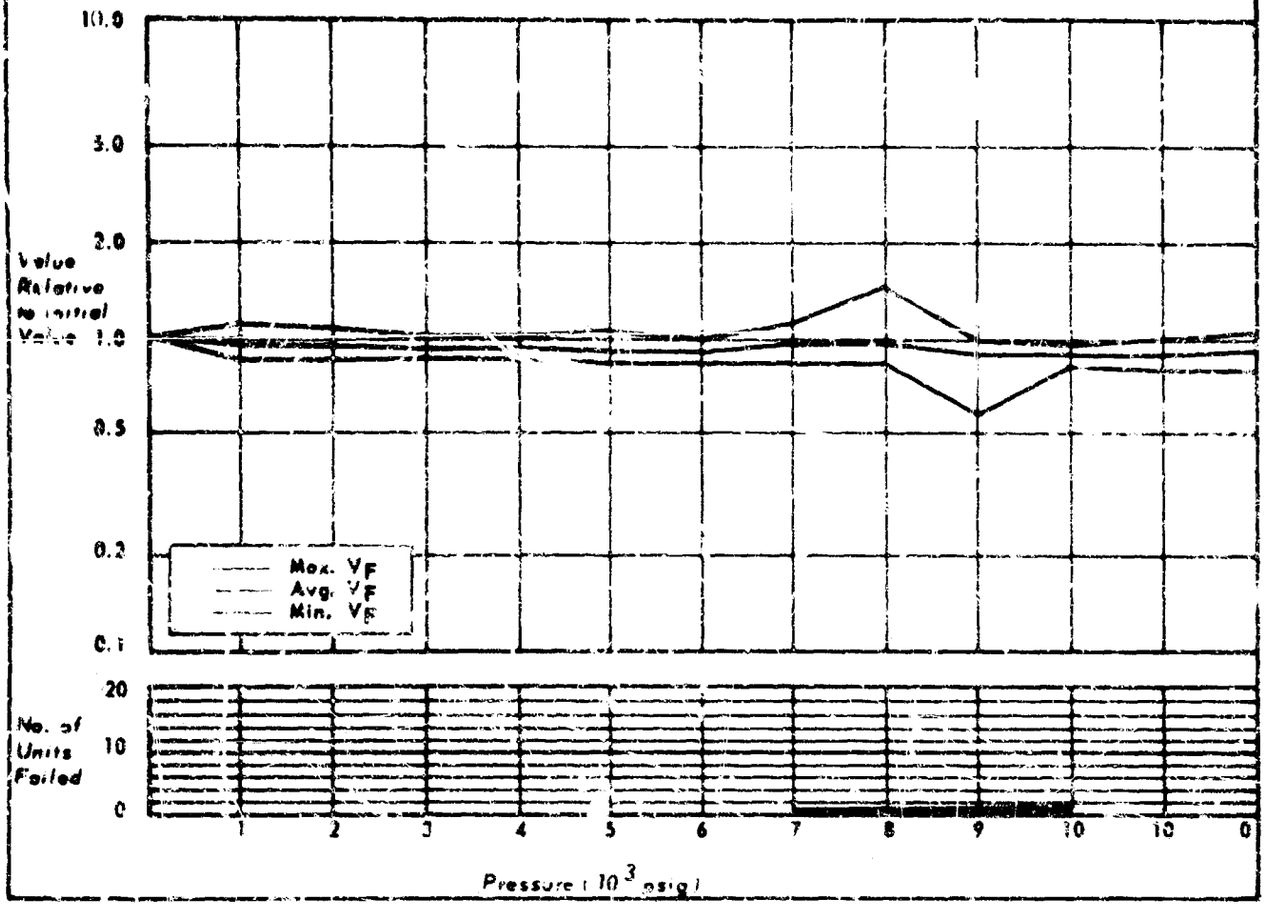
Silicon
Tubular, axial lead
0.26 x 0.09" diam

SOAK PERIOD: None
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

CHART NO. 79

TYPE - SILICON DIODE (LINEAR PRESSURE)
DESCRIPTION - (NONE AVAILABLE)

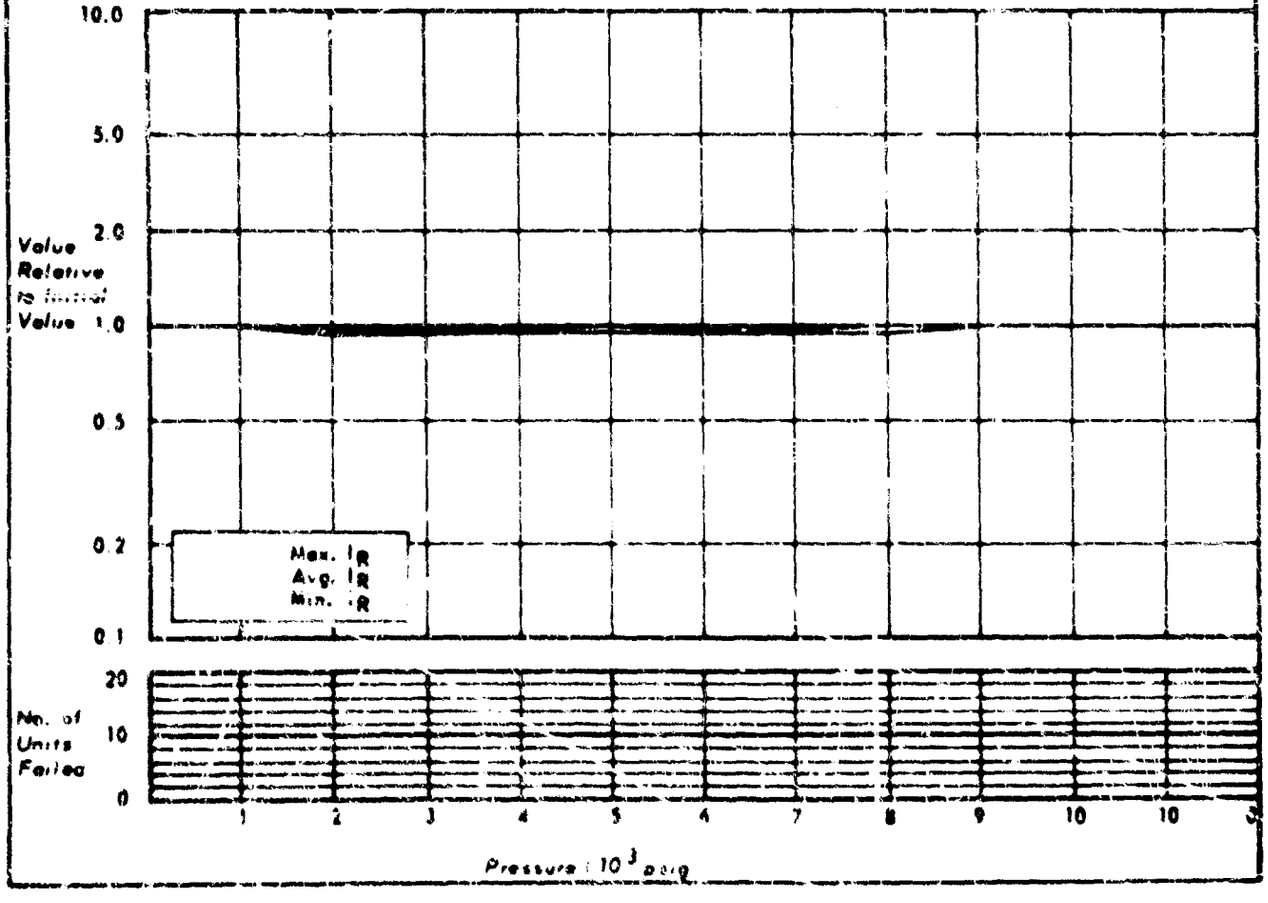
NO. OF SAMPLES TESTED




MFG.
TYPE
DESCRIPTION - (SAME AS ABOVE)

CHART NO. 79A

NO. OF SAMPLES TESTED



Ohmite
Red dot
Diode

Silicone, pressurized units
Tubular, axial lead
0.26 x 0.09" diam

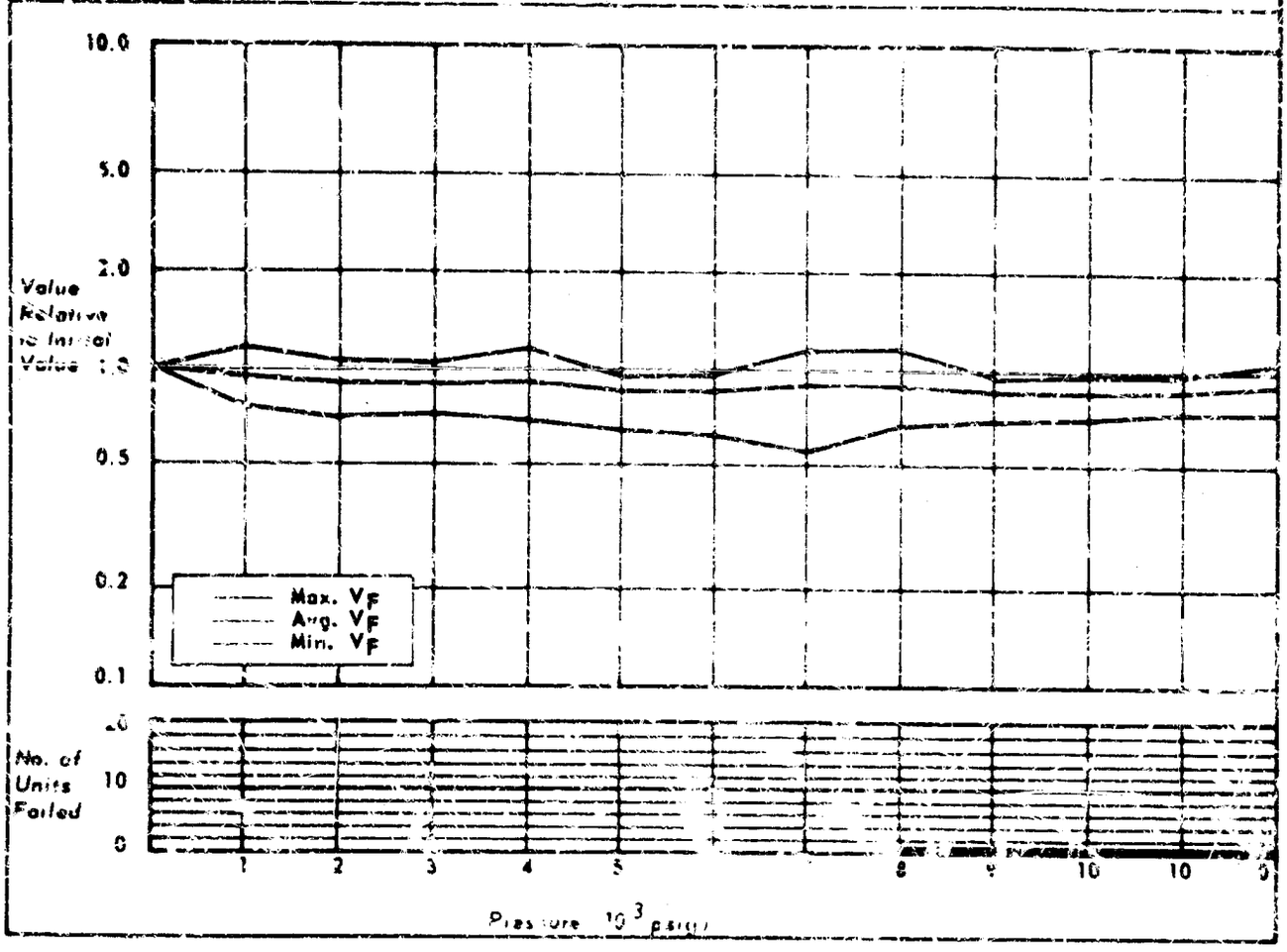
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: Eleven components indicated less than 10% change.
Seven components indicated a change greater than 10% and less than 50%.
One component indicated a change greater than 50% with subsequent recovery at pressures shown on failure graph on opposite page.

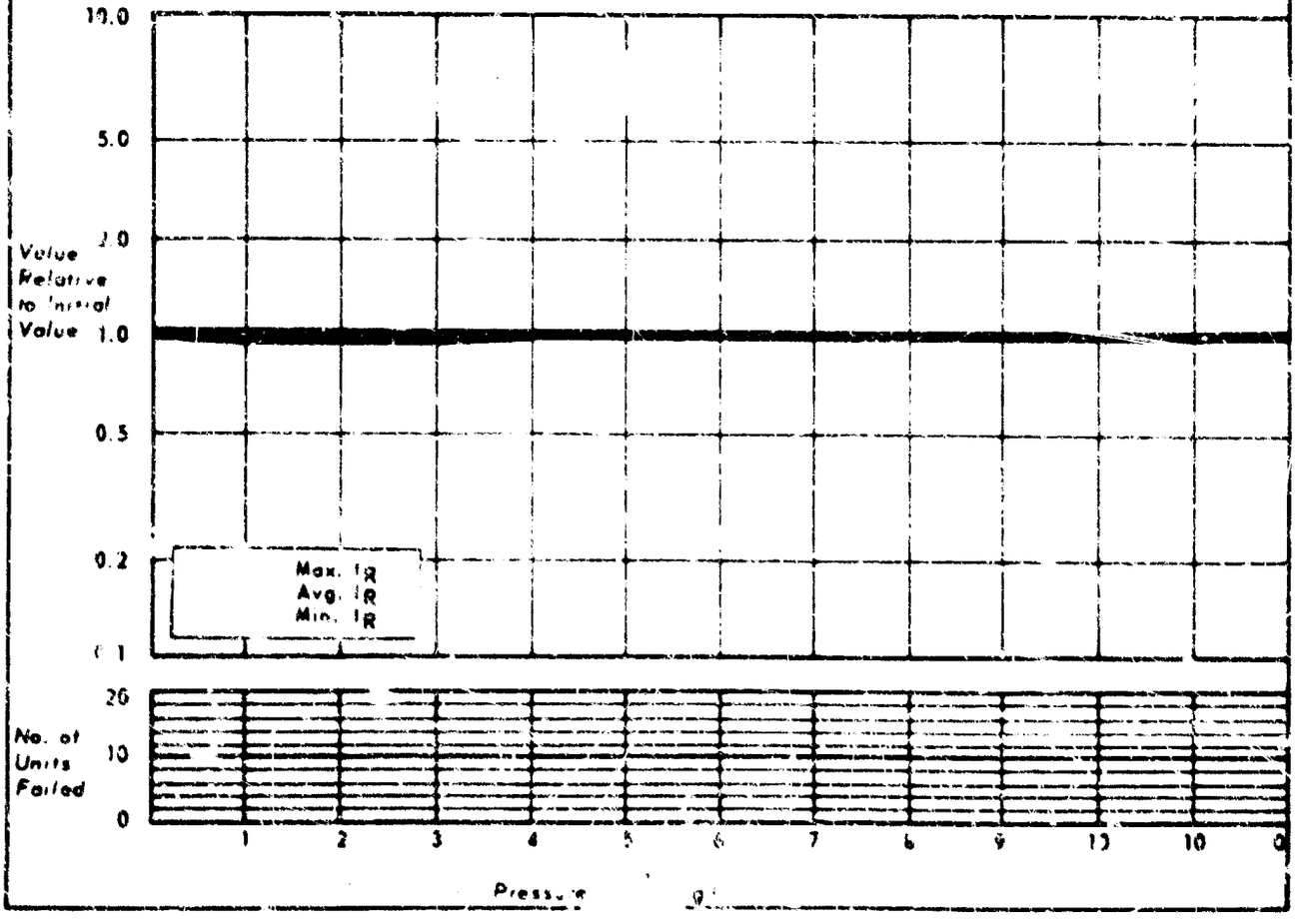
MFG. ONMITE
TYPE GERMANIUM DIODE
DESCRIPTION (NONE AVAILABLE)

CHART NO. 80
NO. OF SAMPLES TESTED 50




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 80A
NO. OF SAMPLES TESTED



Ohmite

Diode

Germanium, glass encap
Tubular, axial lead
0.26 x 0.08" diam

SOAK PERIOD: None

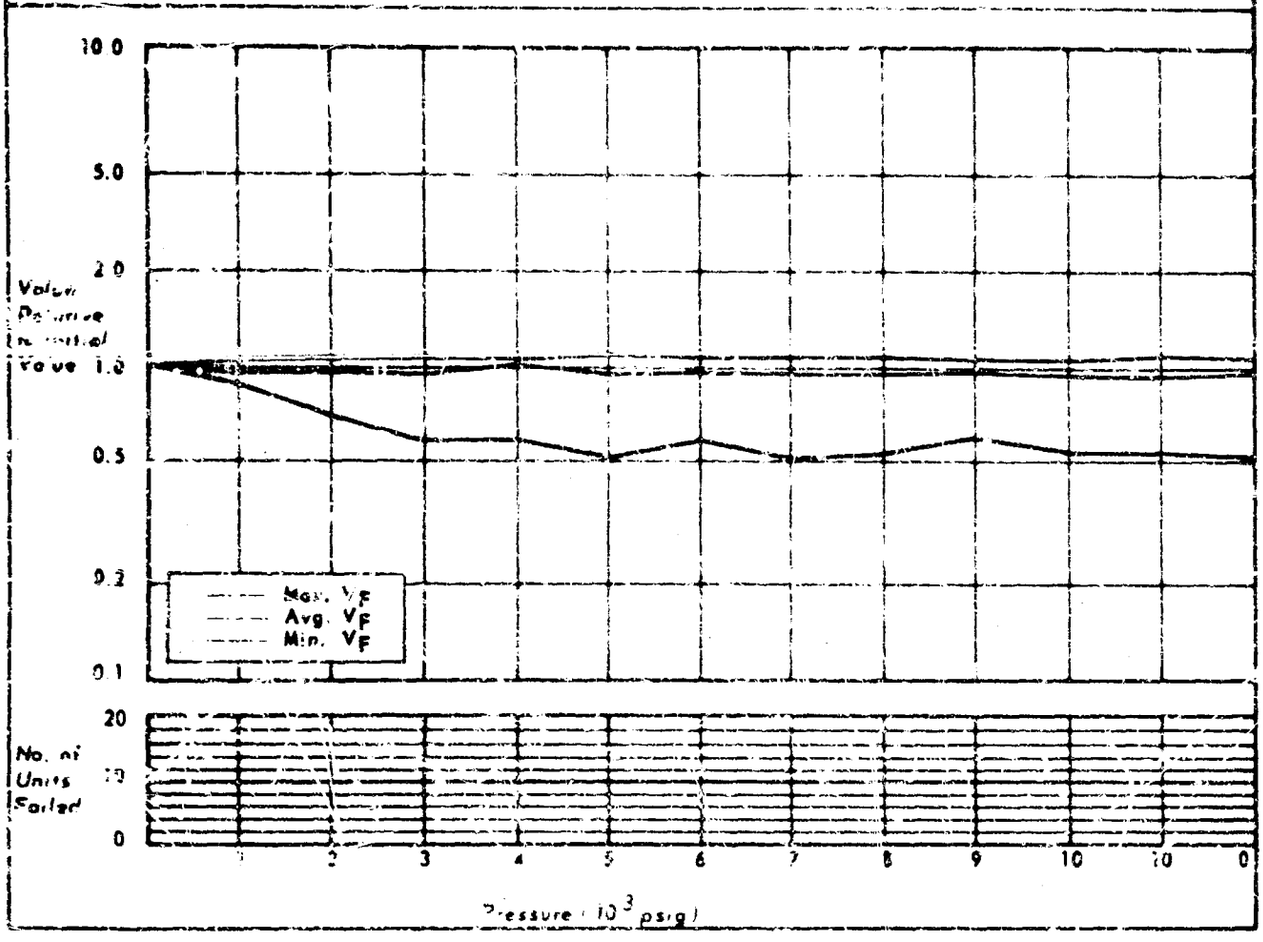
MECHANICAL: No apparent damage.

ELECTRICAL: Fourteen components indicated less than 10% change.
Four components indicated a change greater than 10% and less than 50%.

FAILURES: Two components indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.

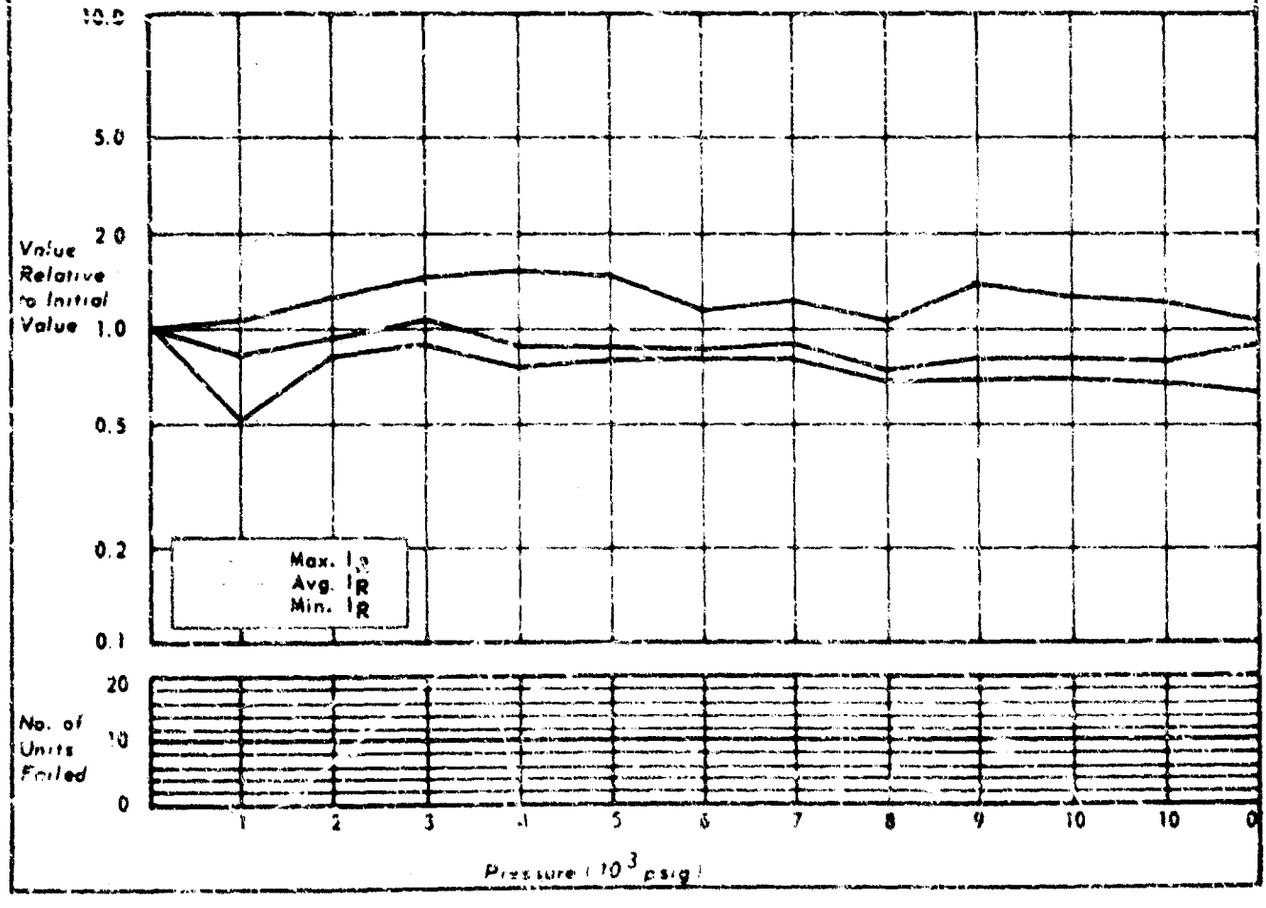
MFG. SYLVANIA
TYPE DIODE, RECTIFIER
DESCRIPTION 1N2069

CHART NO. 81
NO. OF SAMPLES TESTED 19




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 81A
NO. OF SAMPLES TESTED



| | | |
|---|---|---|
| Sylvania | PIV = 600 V | Silicon |
| 1N 2069 | $I_{dc\ avg.}$ = 750 mA | Epoxy, encap |
| Diode, rectifier | | Bullet type |

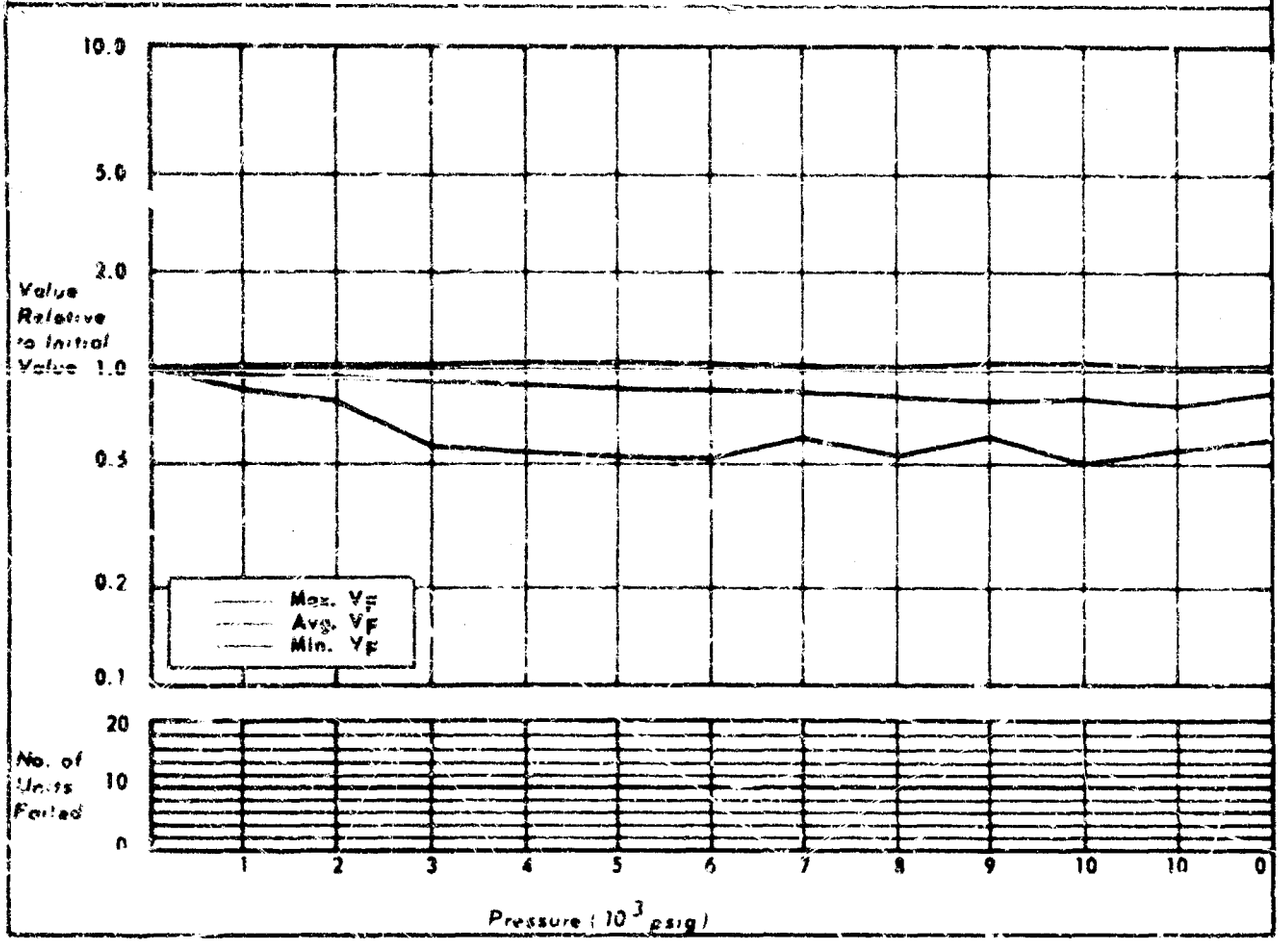
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 50% and greater than 10% change.

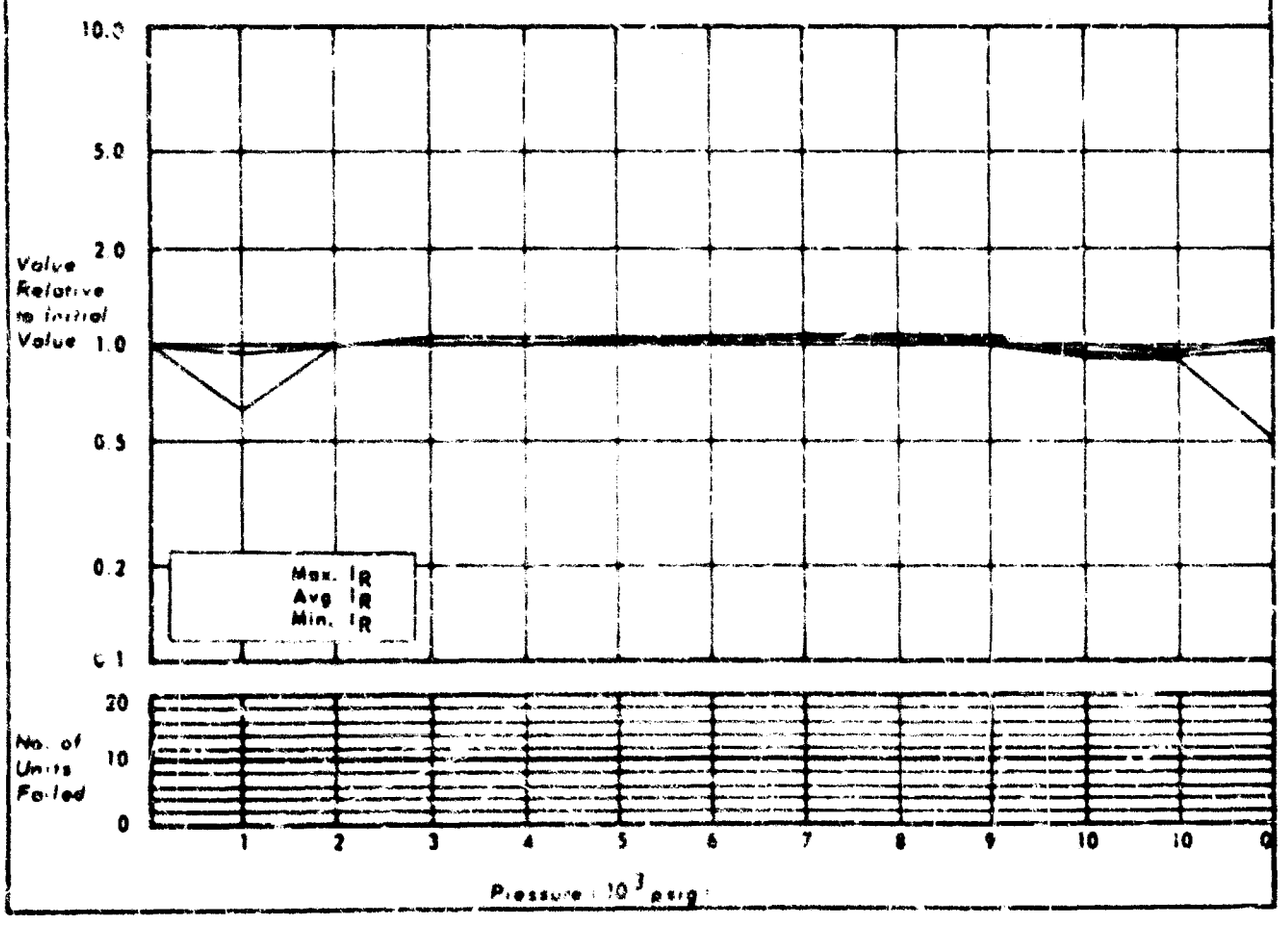
MFG. - SYLVANIA
TYPE - DIODE
DESCRIPTION - G*28

CHART NO. 82
NO. OF SAMPLES TESTED - 17




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 82A
NO. OF SAMPLES TESTED



Sylvania
DF 28
Diode, "whiskerless"

$V_F$ = 1.0 V @ 10 mA
$I_R$ = 0.1 μA @ -20 $V_R$

Planar diffused
Passivated
Glass, metal seal

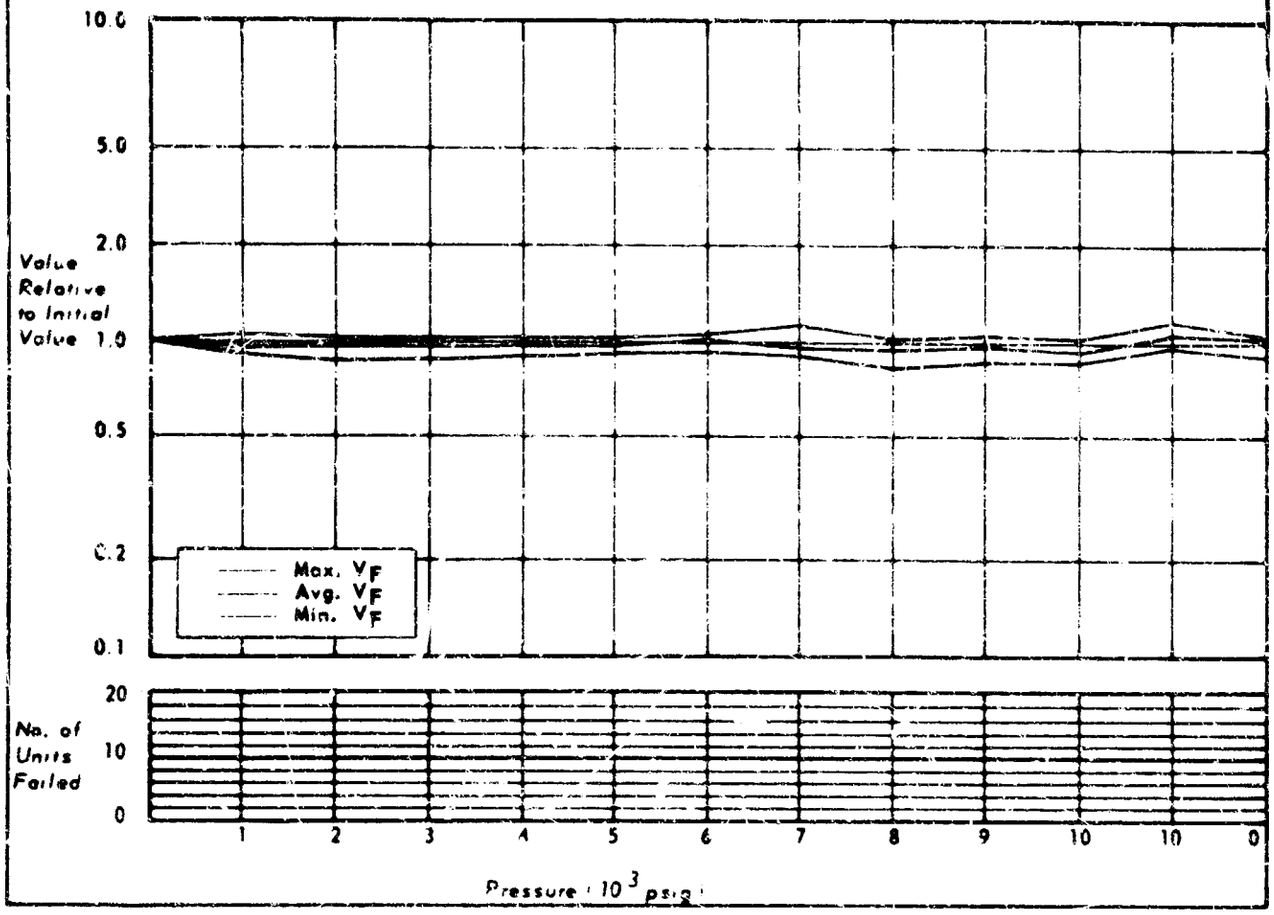
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: Two components indicated less than 10% change. Fifteen components indicated greater than 10% and less than 50% change.

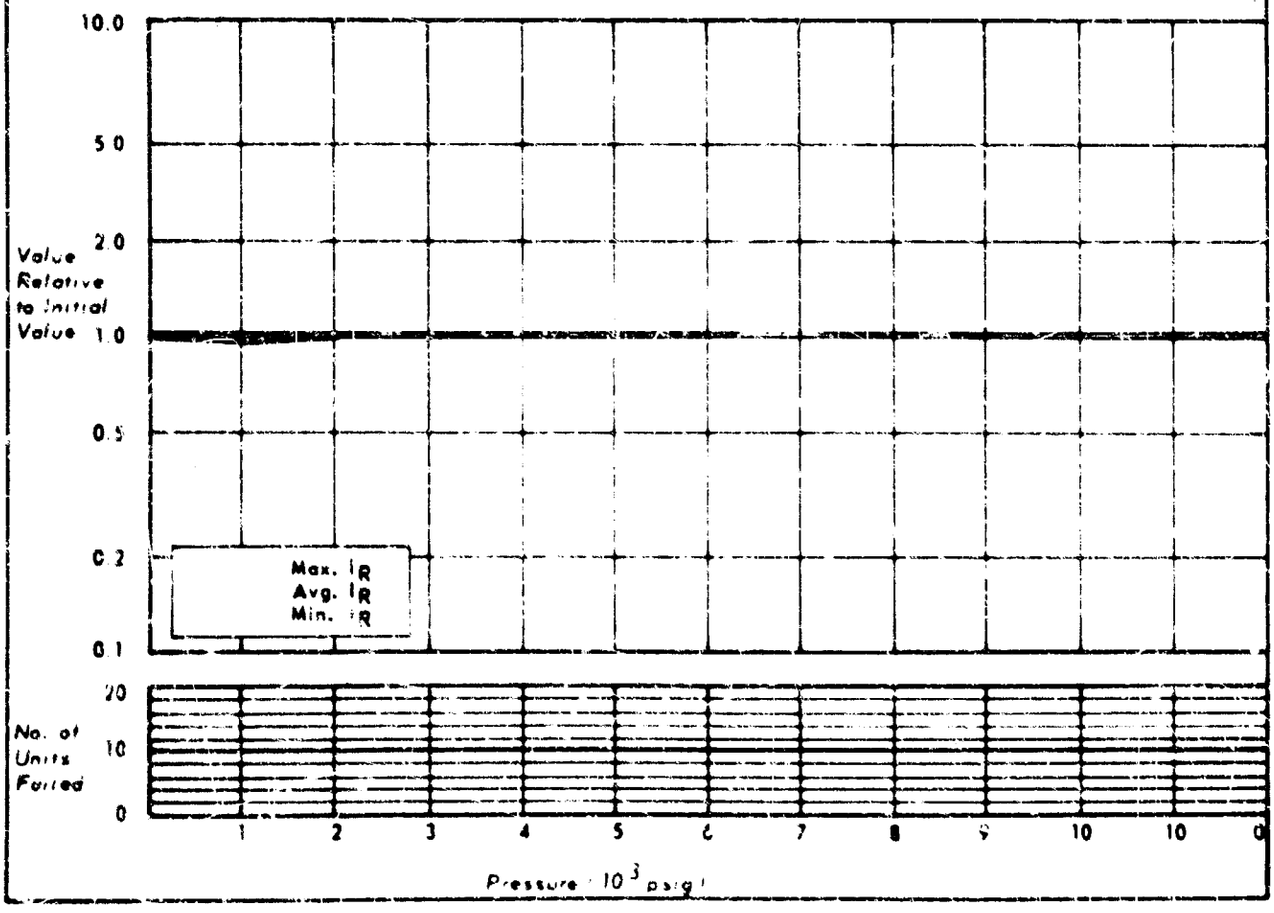
MFG. - TEXAS INSTRUMENT
TYPE - DIODE
DESCRIPTION - 1N251

CHART NO. 83
NO. OF SAMPLES TESTED - 20




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 83A
NO. OF SAMPLES TESTED



Texas Instrument
1N 251
Diode, computer

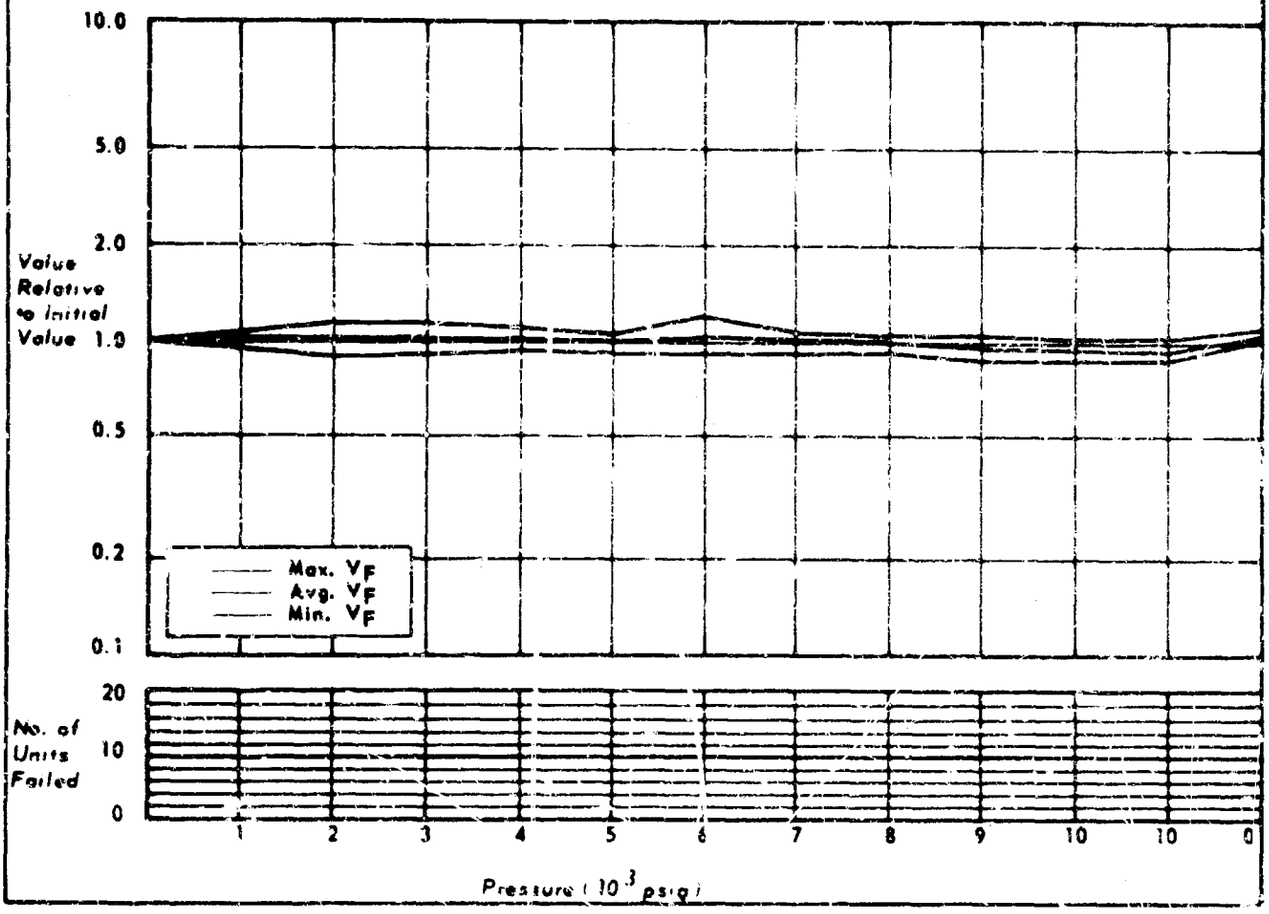
PIV = 30 V
$I_{dc\ avg.}$ = 75 mA

Silicone, glass
Defused, meso
Tubular, axial lead
0.22 x 0.085" diam

SOAK PERIOD: 16 hours at 10,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

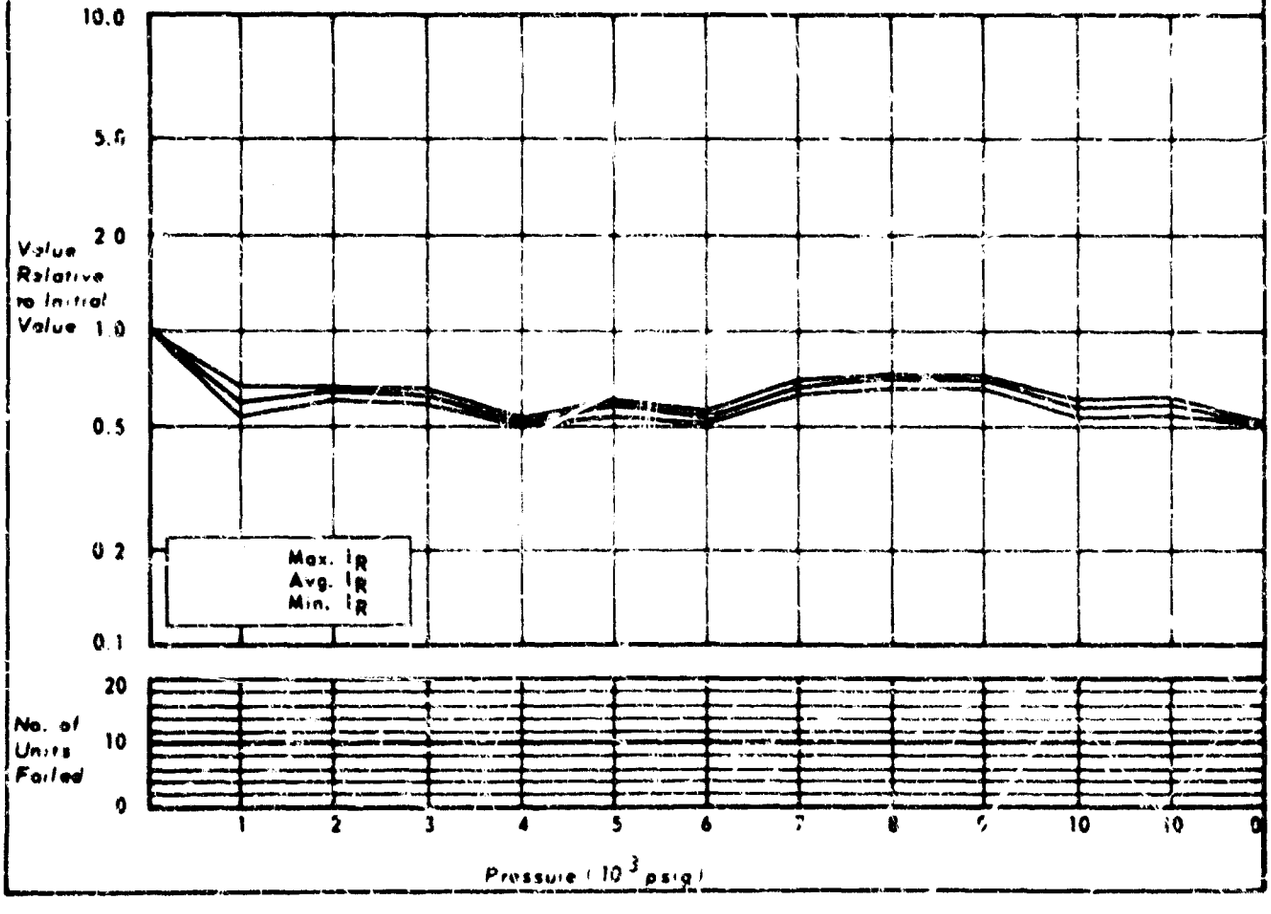
MFG. - TEXAS INSTRUMENT
TYPE - DIODE
DESCRIPTION - 1N645

CHART NO. 84
NO. OF SAMPLES TESTED - 19




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 84A
NO. OF SAMPLES TESTED



Texas Instrument
1N 645
Diode, general

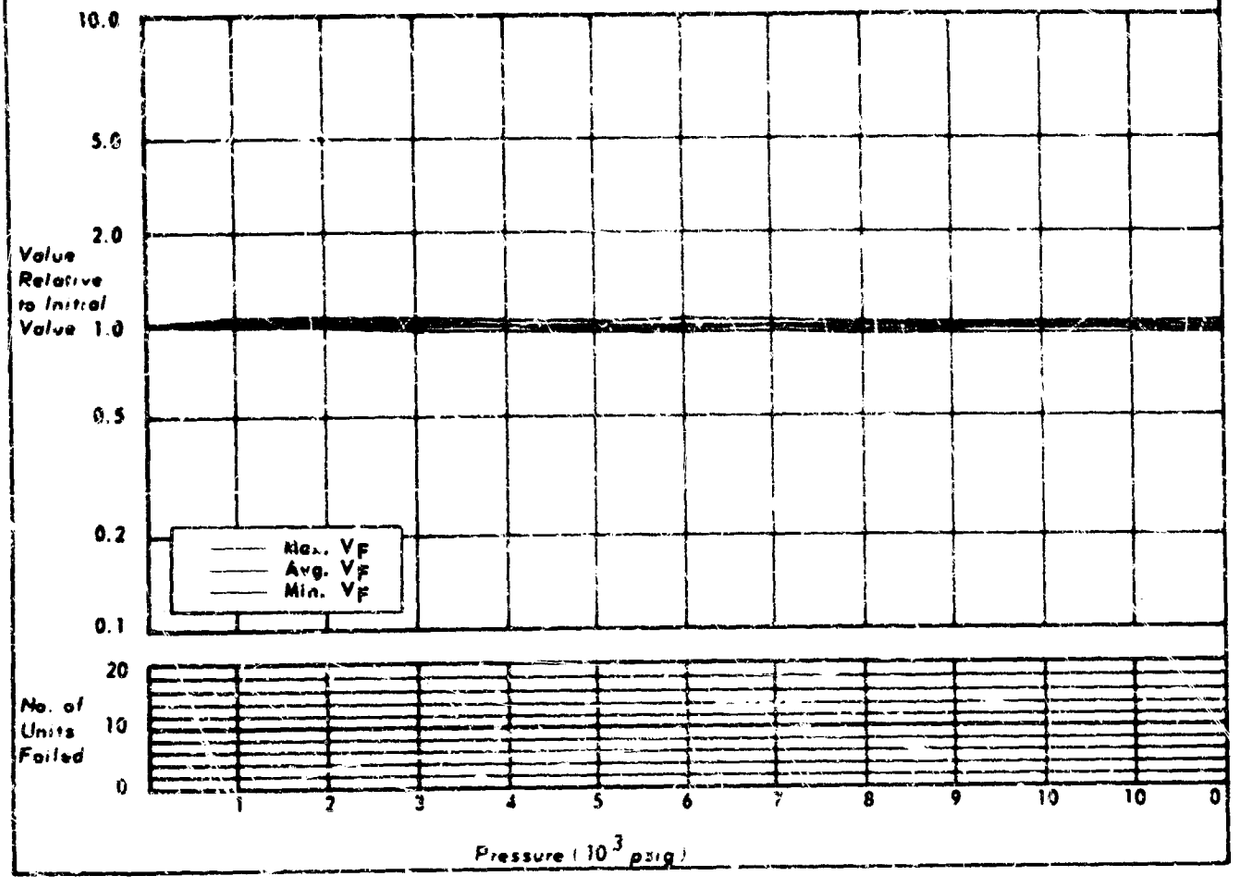
PIV = 225 V
$I_{dc\ avg.}$ = 400 mA

Silicone, glass
Tubular, axial lead
0.3 x 0.02" diam

SOAK PERIOD: 16 hours at 10,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

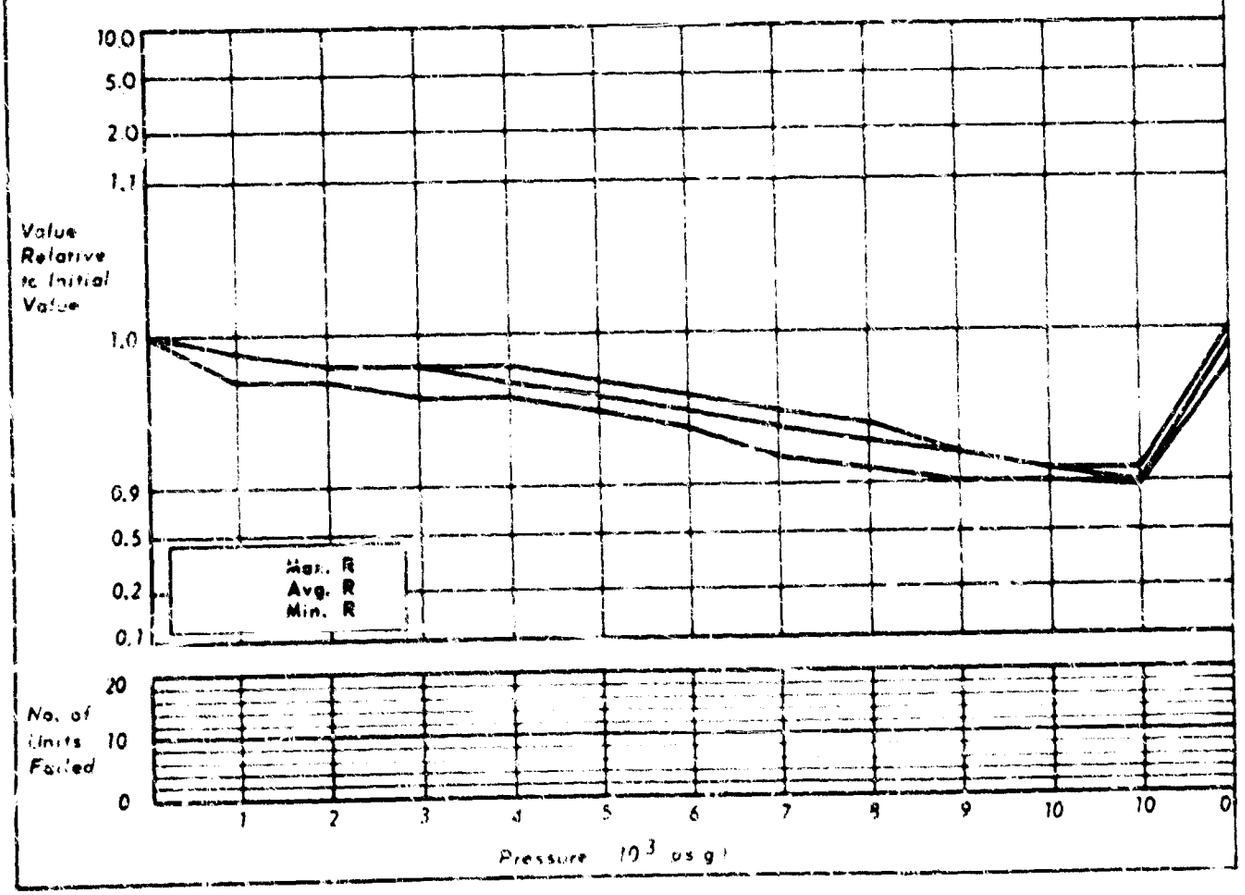
MFG. - TEXAS INSTRUMENT
TYPE - 01002
DESCRIPTION - INTSI

CHART NO. 85
NO. OF SAMPLES TESTED - 20




MFG. - ALLEN BRADLEY
TYPE - RESISTOR
DESCRIPTION - BB 1015

CHART NO. 86
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Texas Instruments | $V_Z$ = 5.1 V | Silicon, glass encap |
| 1N 751 | P = 400 mW @ 25°C | Tubular, axial lead |
| Diode | | 0.3 x 0.02" diam |

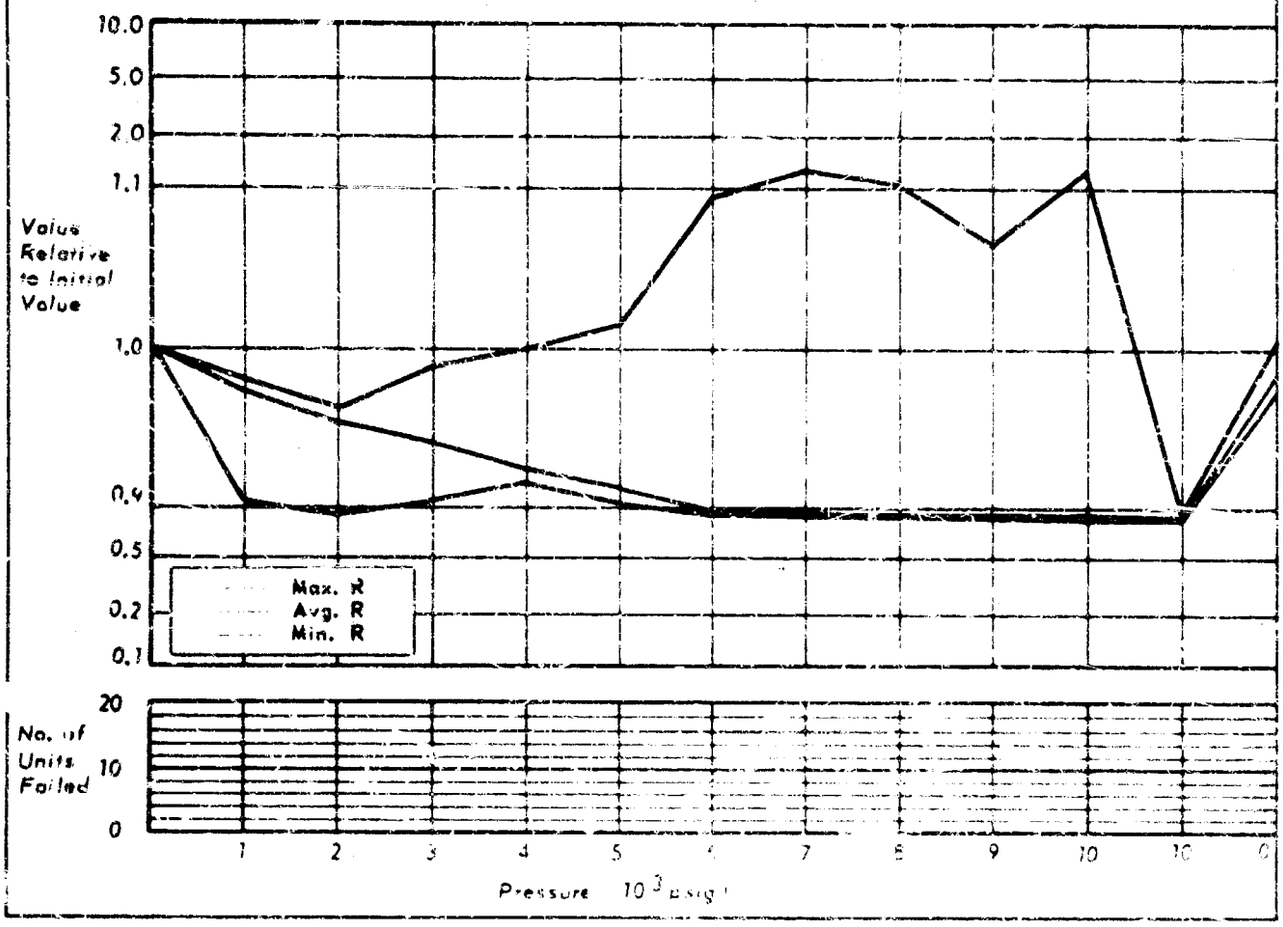
SOAK PERIOD: None
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Allen-Bradley | 100 Ω ± 5% | Composition |
| BB 1015 | 3.54 V max | Tubular, axial lead |
| Resistor | 0.125 W | 0.165 x 0.062" diam |

SOAK PERIOD: 15.5 hours at 10,000 psig.
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

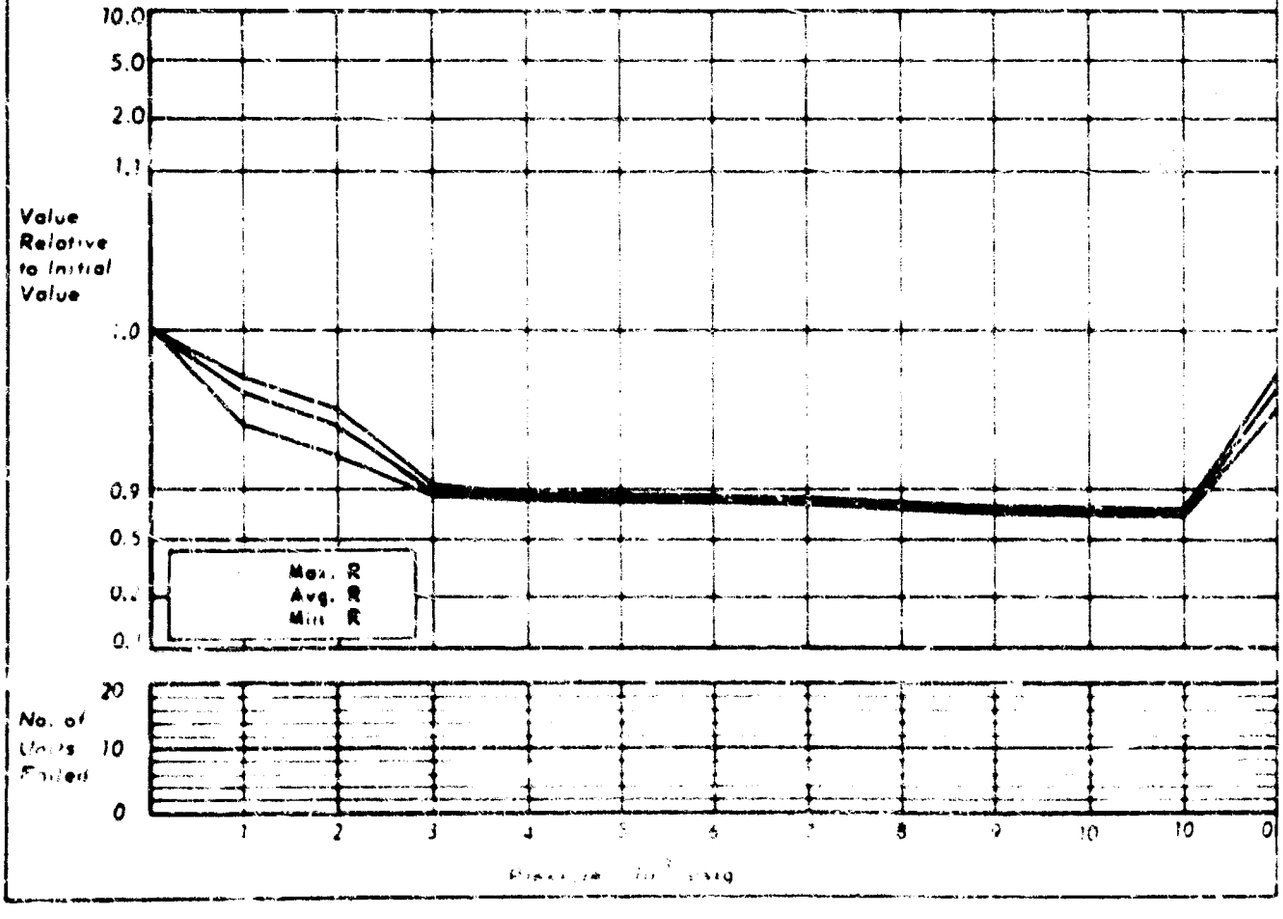
MFG. - ALLEN BRADLEY
TYPE - RESISTOR
DESCRIPTION - 89-1055

CHART NO. 87
NO. OF SAMPLES TESTED - 20




MFG. - ALLEN BRADLEY
TYPE - RESISTOR
DESCRIPTION - 89-1055

CHART NO. 88
NO. OF SAMPLES TESTED - 19



| | | |
|---|---|---|
| Allen-Bradley | 10 KΩ ± 5% | Composition |
| BB 1035 | 35.36 V max | Tubular, axial lead |
| Resistor | 0.125 W | 0.165 x 0.062" diam. |

SOAK PERIOD: 15.5 hours at 10,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated a change greater than 10% and less than 50%

| | | |
|---|---|---|
| Allen-Bradley | 1.0 MΩ ± 5% | Composition |
| BB 1055 | 150.00 V max | Tubular, axial lead |
| Resistor | | 0.145 x 0.062" diam. |

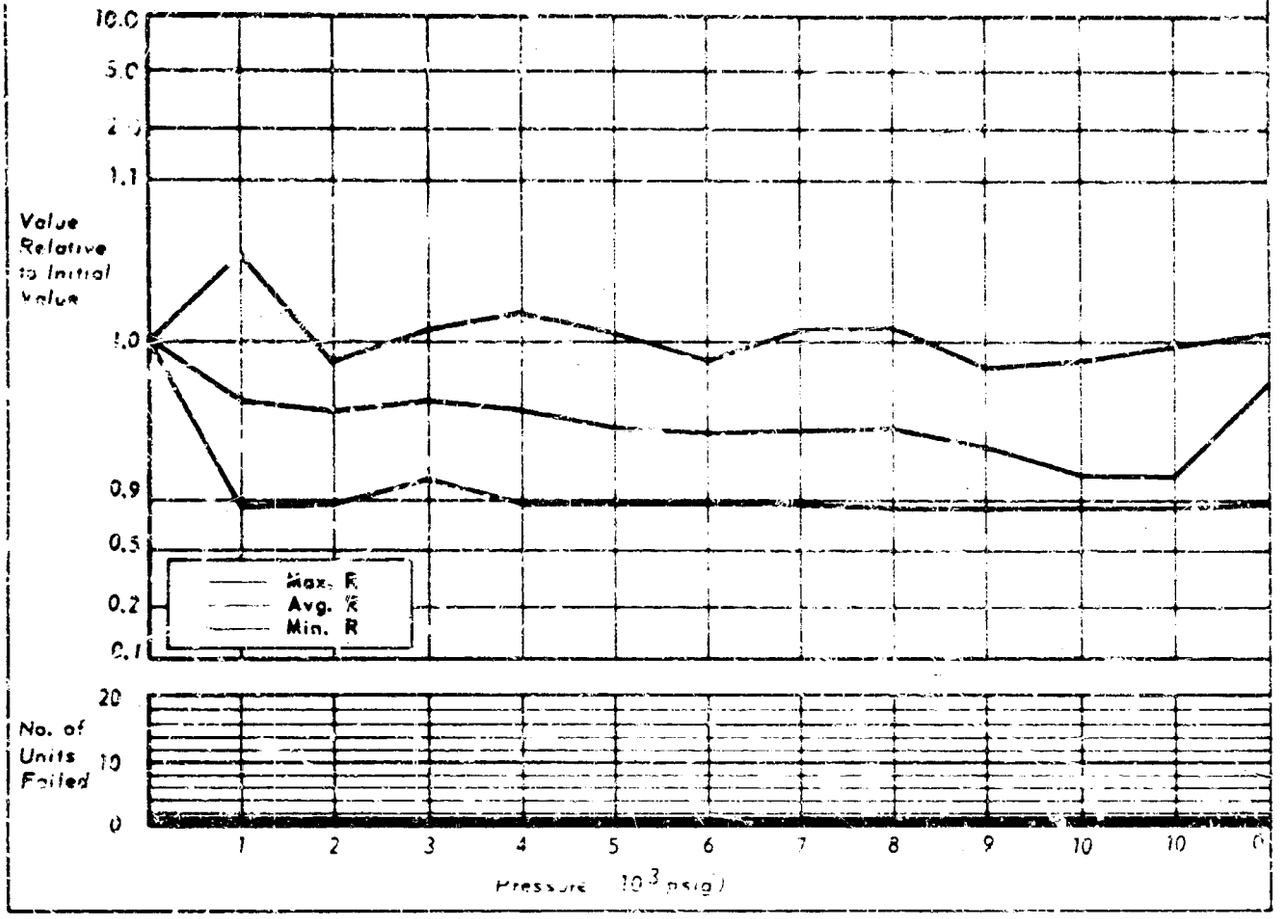
SOAK PERIOD: 15.5 hours at 10,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated a change greater than 10% with subsequent recovery to less than 10% change on return to 0 psig.

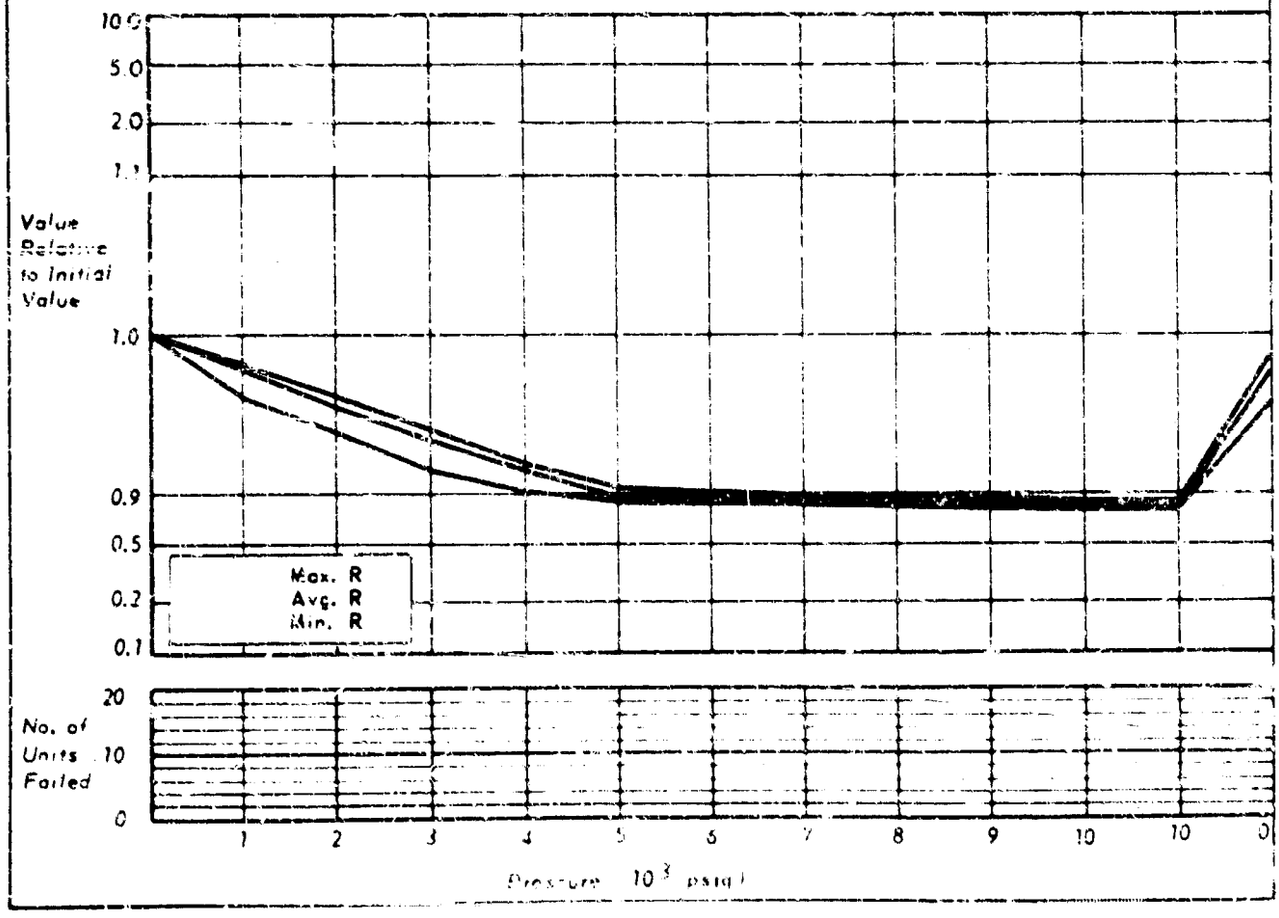
MFG. - ALLEN BRADLEY
TYPE - RESISTOR
DESCRIPTION - CB-1035

CHART NO. 89
NO. OF SAMPLES TESTED - 19




MFG. - ALLEN BRADLEY
TYPE - RESISTOR
DESCRIPTION - CB-1035

CHART NO. 90
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Allen-Bradley | 10 Ω± 5% | Composition |
| CB 1005 | 1.58 V max | Tubular, axial lead |
| Resistor | 0.25 W | 0.25 x 0.09" diam. |

SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: One component indicated a change greater than 10% and less than 50%.

Eighteen components indicated less than 10% change.

FAILURES: One component indicated a change greater than 50% with subsequent recovery at pressures shown on failure graph on opposite page.

| | | |
|---|---|---|
| Allen-Bradley | 10 K Ω ± 5% | Composition |
| CB 1035 | 50.0 V max | Tubular, axial lead |
| Resistor | 0.25 W max | 0.25 x 0.09" diam. |

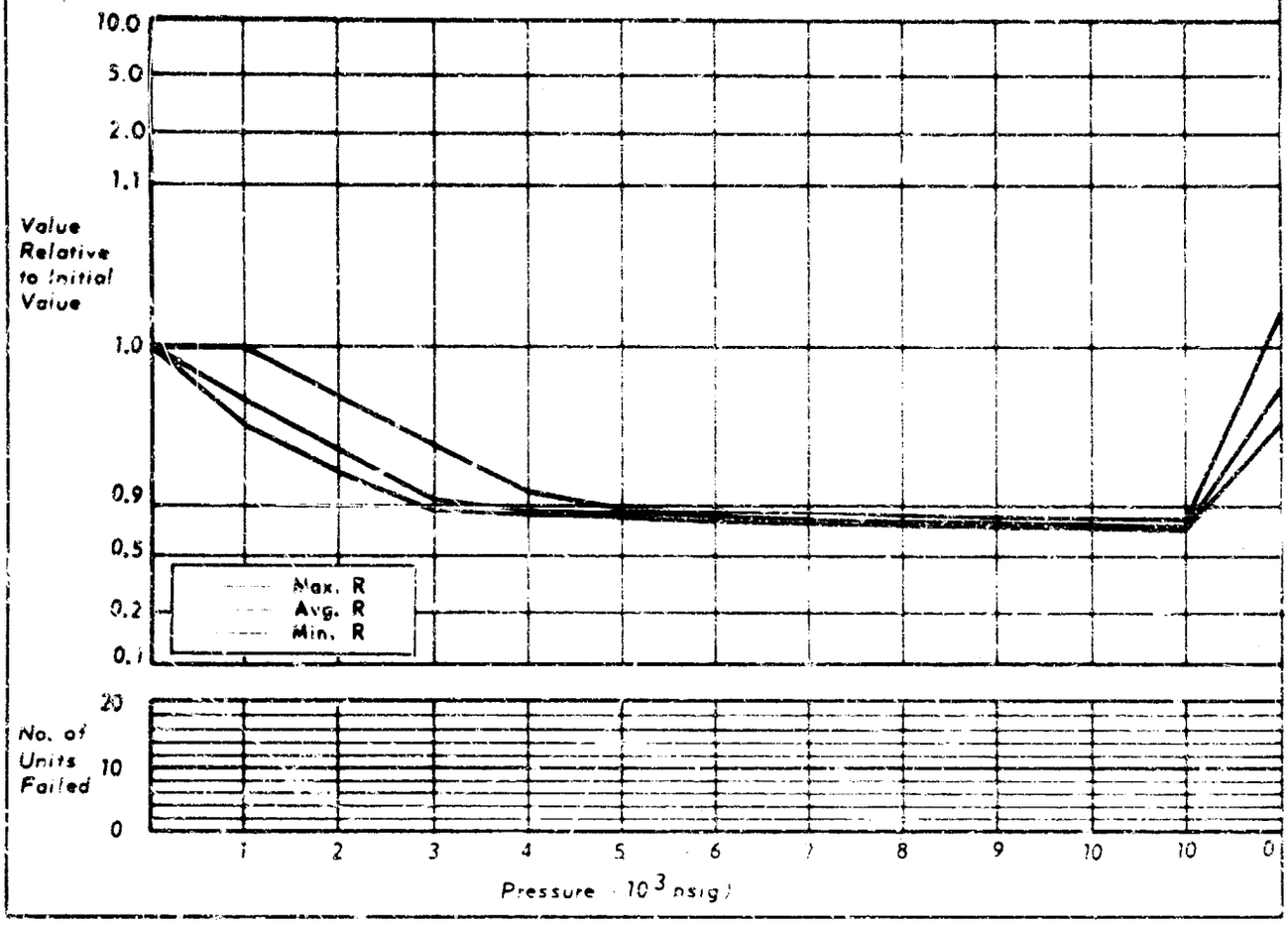
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated a change greater than 10% with subsequent recovery to less than 10% change on return to 0 psig.

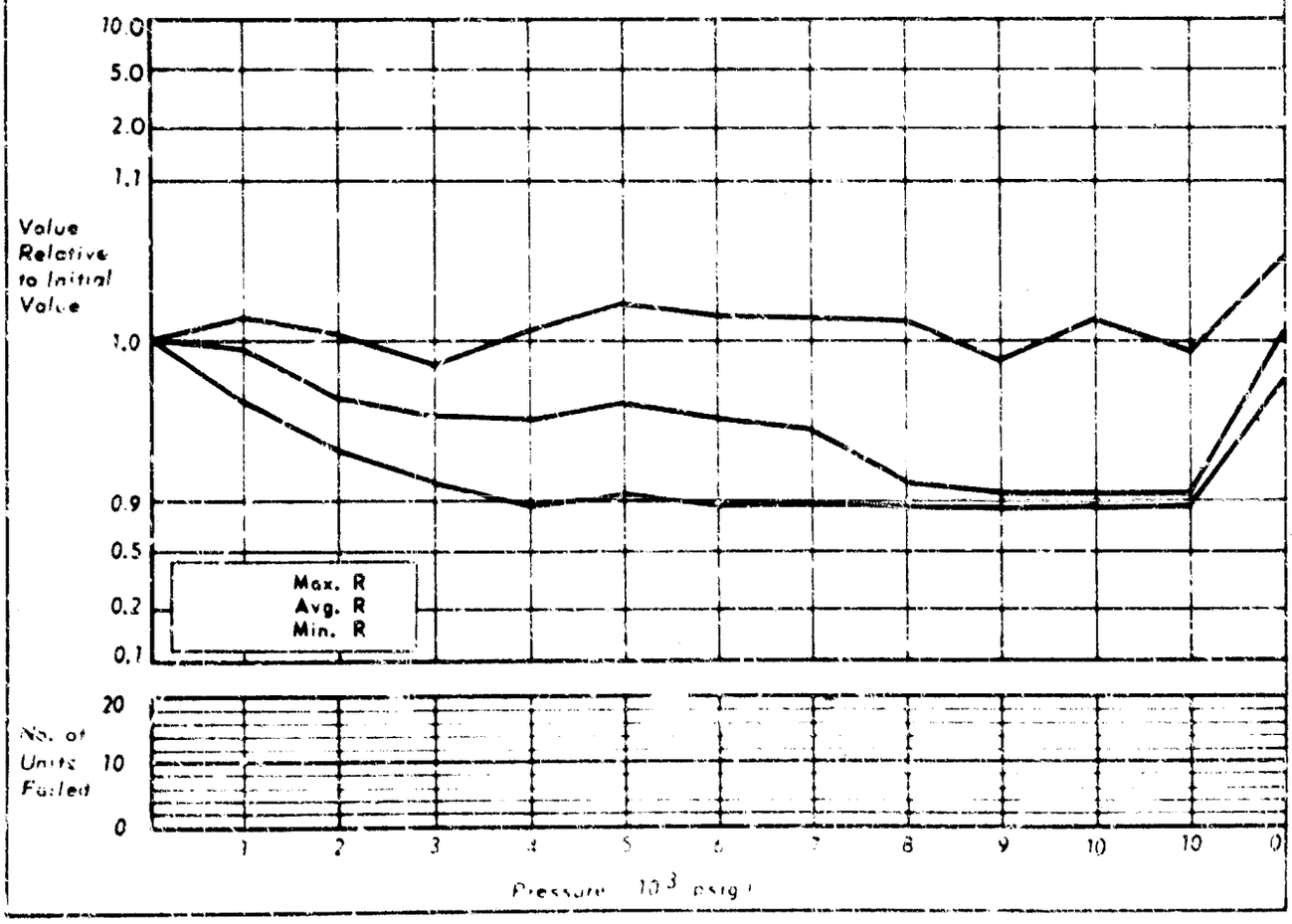
MFG. - ALLEN BRADLEY
TYPE - RESISTOR
DESCRIPTION - CB-1055

CHART NO. 91
NO. OF SAMPLES TESTED - 20




MFG. - ALLEN BRADLEY
TYPE - RESISTOR
DESCRIPTION - EB-1005

CHART NO. 92
NO. OF SAMPLES TESTED - 19



| | | |
|---|---|---|
| Allen-Bradley | 1.0 MΩ ± 5% | Composition |
| CB 1035 | 250.0 V max | Tubular, axial lead |
| Resistor | | 0.375 x 0.14" diam. |

SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated a change greater than 10% with subsequent recovery to less than 10% change on return to 0 psig.

| | | |
|---|---|---|
| Allen-Bradley | 10 Ω ± 5% | Composition |
| EB 1005 | 2.23 V max | Tubular, axial lead |
| Resistor | 0.5 W | 0.375 x 0.14" diam. |

SOAK PERIOD: 16 hours at 7,000 psig.

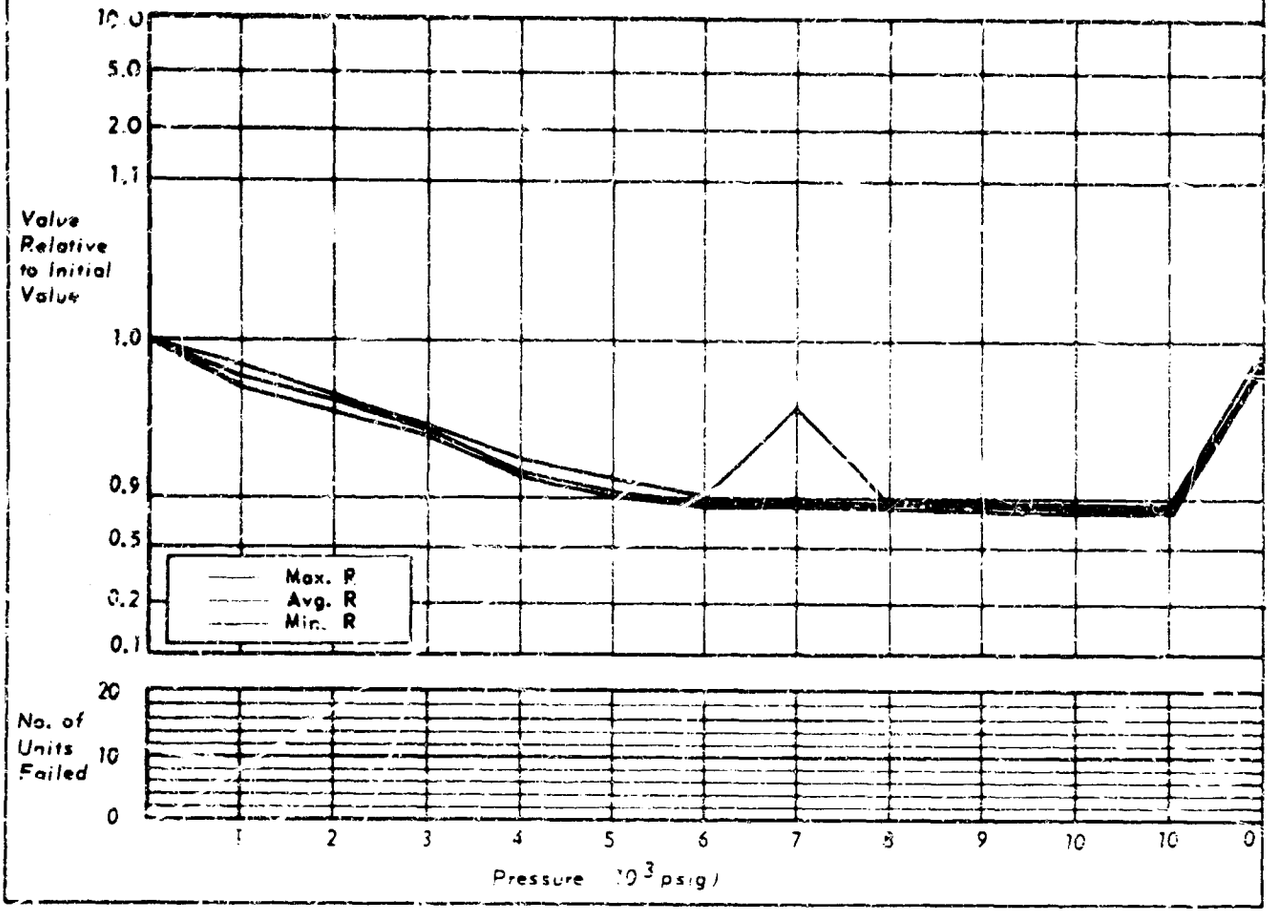
MECHANICAL: No apparent damage.

ELECTRICAL: Six components indicated a change greater than 10% with subsequent recovery to less than 10% change on return to 0 psig.

Thirteen components indicated less than 10% change.

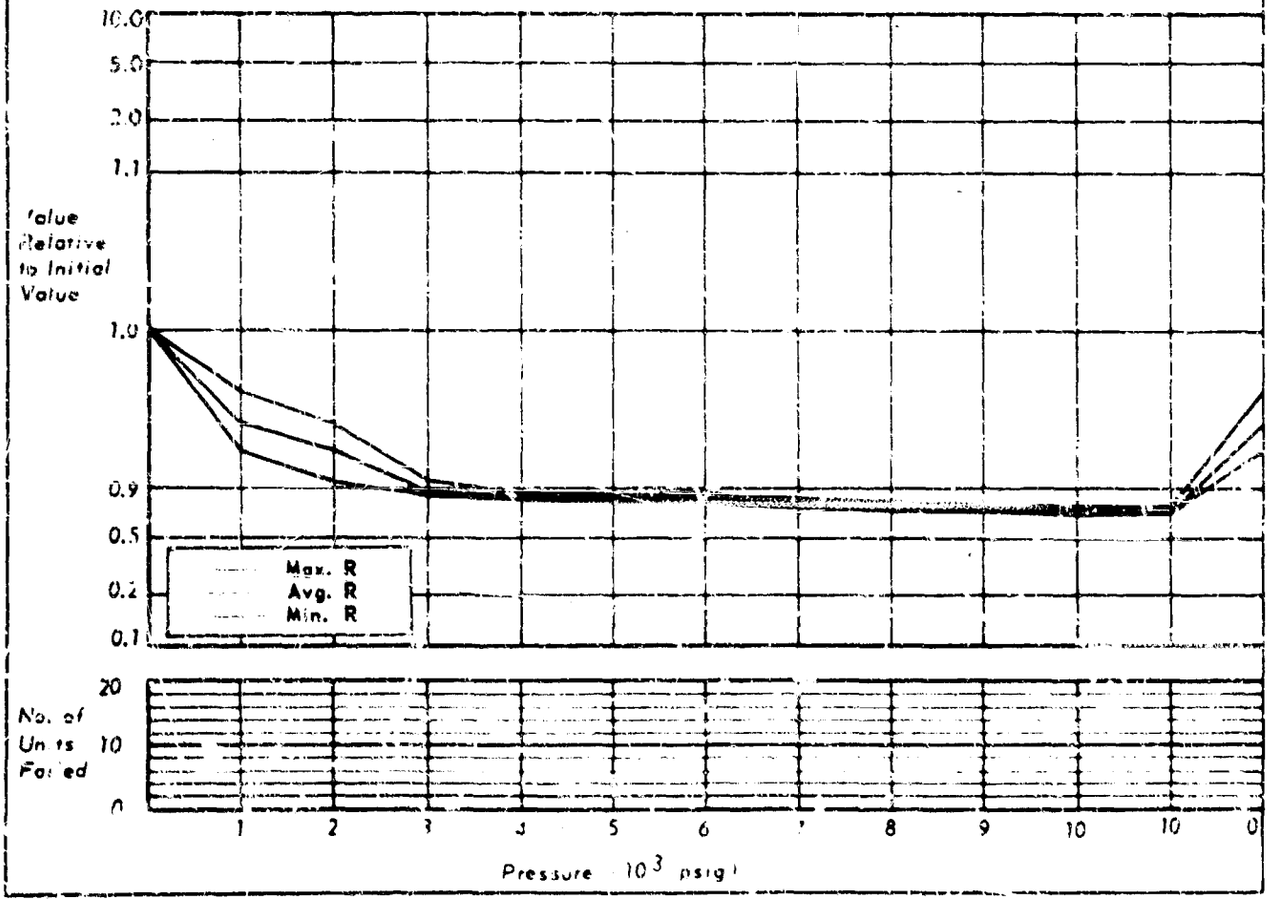
MFG.-ALLEN BRADLEY
TYPE-RESISTOR
DESCRIPTION-EB-1035

CHART NO. 93
NO. OF SAMPLES TESTED-20




MFG.-ALLEN BRADLEY
TYPE-RESISTOR
DESCRIPTION-EB-1055

CHART NO. 94
NO. OF SAMPLES TESTED-19



| | | |
|---|---|---|
| Allen-Bradley | 10 KΩ ± 5% | Composition |
| EB 1035 | 70.71 V max | Tubular, axial lead |
| Resistor | 0.5 W | 0.373 x 0.14" diam. |

SOAK PERIOD: 16 hours at 7,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated a change greater than 10% with subsequent recovery to less than 10% change on return to 0 psig.

| | | |
|---|---|---|
| Allen-Bradley | 3.0 MΩ ± 5% | Composition |
| EB 1055 | 350.0 V max | Tubular, axial lead |
| Resistor | | 0.375 x 0.14" diam. |

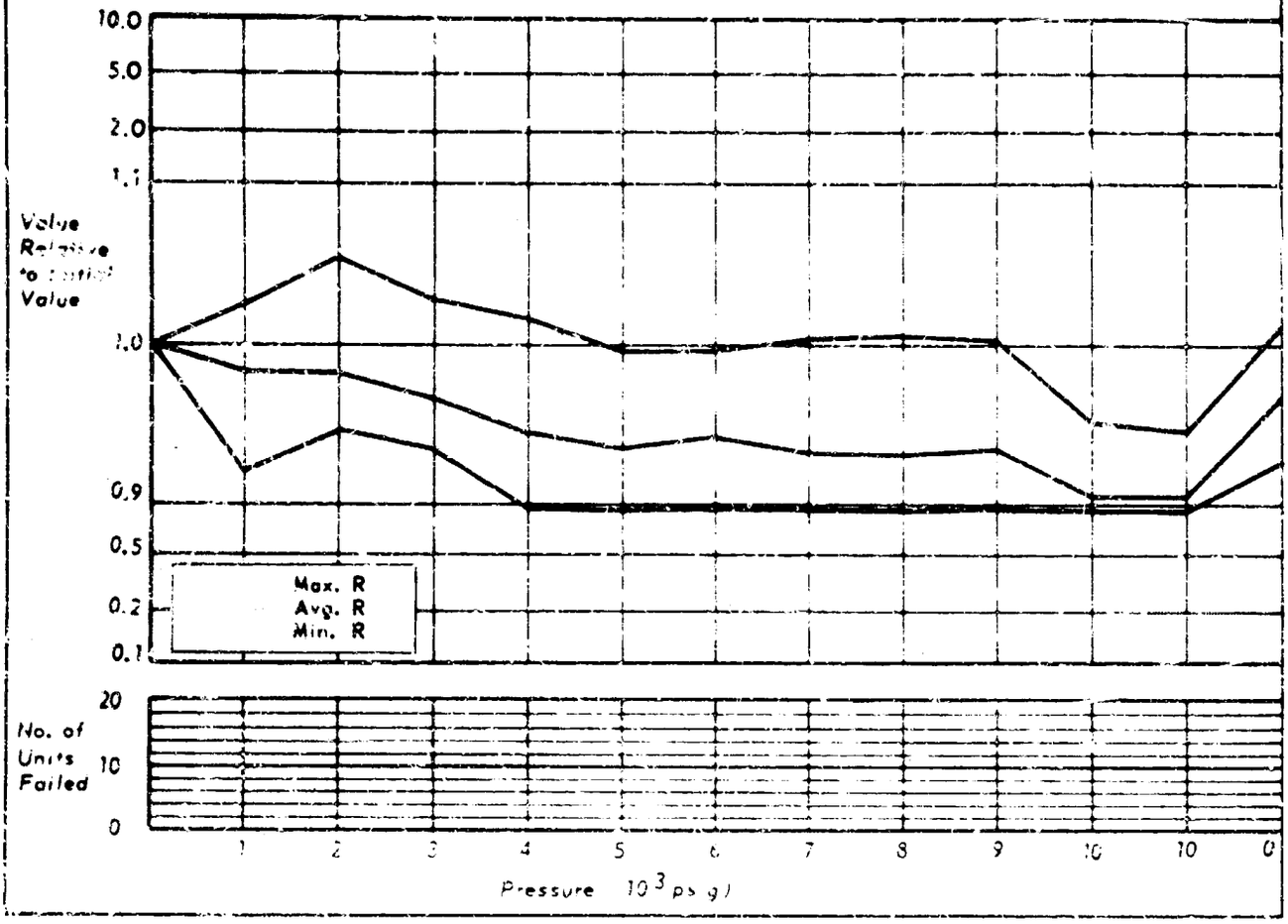
SOAK PERIOD: 15.5 hours at 10,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated a change greater than 10% with subsequent recovery to less than 10% change on return to 0 psig.

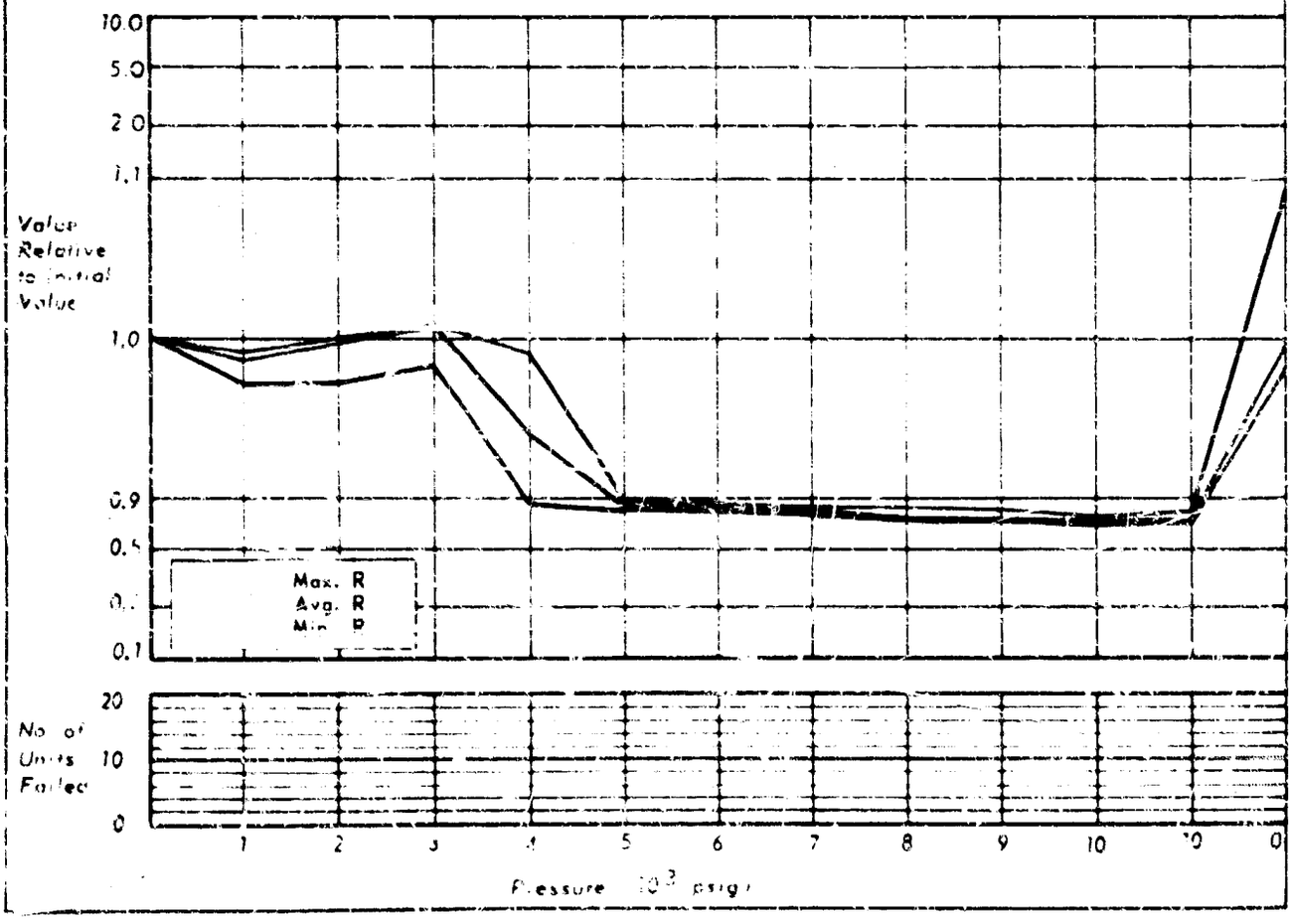
MFG.-ALLEN BRADLEY
TYPE-RESISTOR
DESCRIPTION-CB-1004

CHART NO. 95
NO. OF SAMPLES TESTED-20




MFG.-ALLEN BRADLEY
TYPE-RESISTOR
DESCRIPTION-CB-1034

CHART NO. 95
NO. OF SAMPLES TESTED-20



| | | |
|---|---|---|
| Allen-Bradley | 10Ω ± 2% | Composition, herm sealed |
| CS 1004 | 1.58 V max | Tubular, axial lead |
| Resistor | 0.25 W | 0.375 x 0.14" diam |

SOAK PERIOD: 15 hours at 8,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: Three components indicated a change greater than 10% with subsequent recovery to less than 10% change on return to 0 psig.

| | | |
|---|---|---|
| Allen-Bradley | 10 KΩ ± 2% | Composition, herm sealed |
| CS 1034 | 50.0 V max | Tubular, axial lead |
| Resistor | 0.25 W | 0.375 x 0.14" diam |

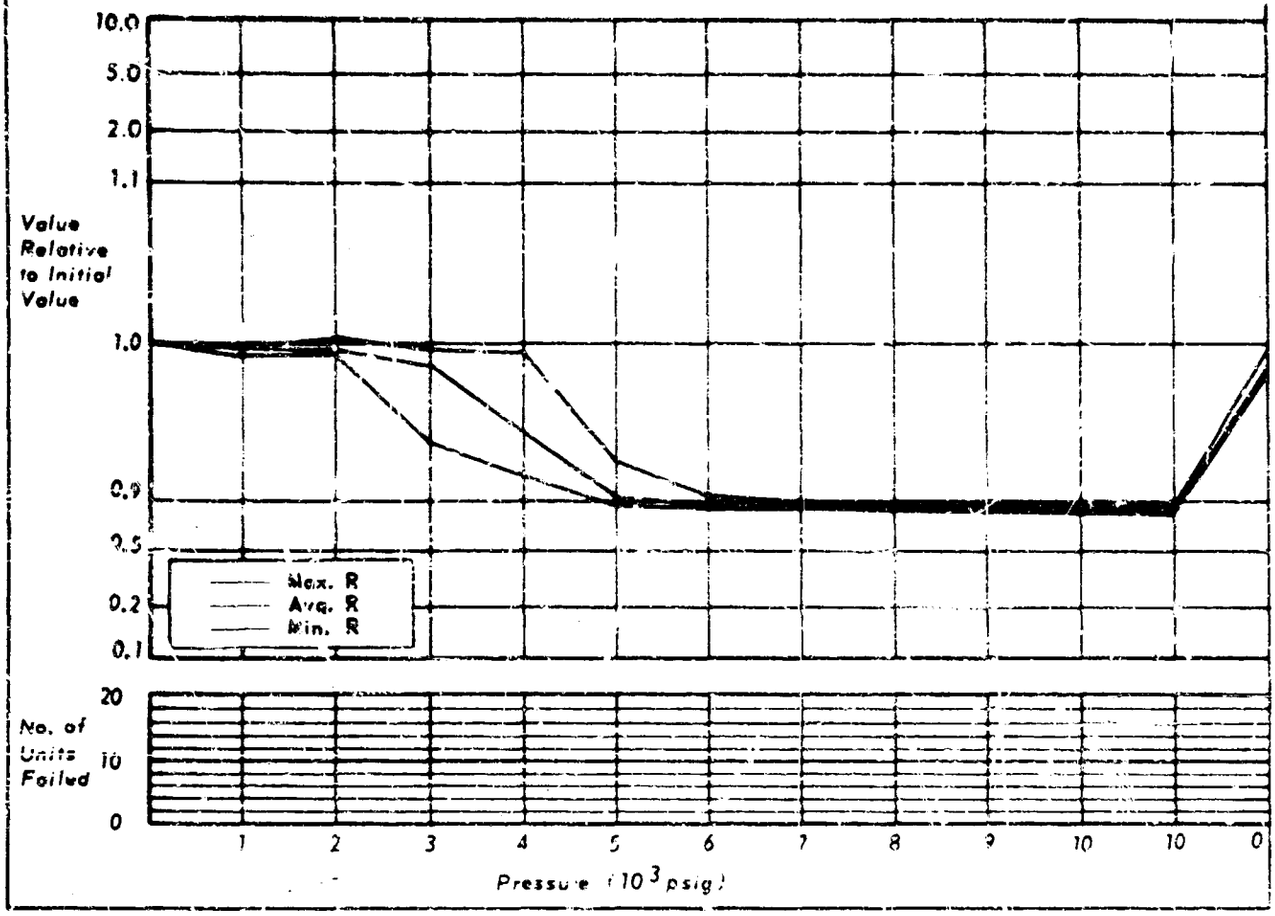
SOAK PERIOD: 16 hours at 7,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated a change greater than 10% with subsequent recovery to less than 10% change on return to 0 psig.

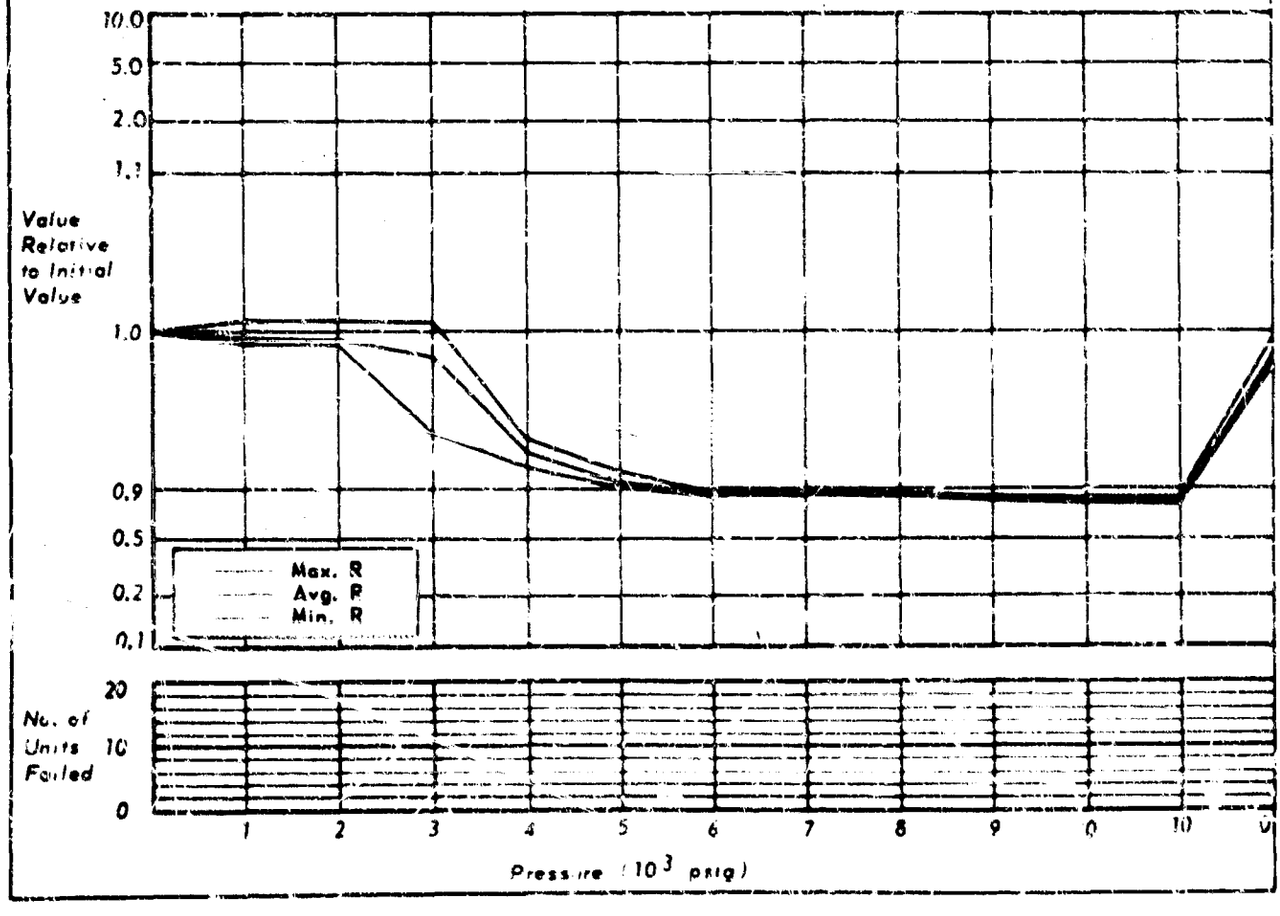
MFG.-ALLEN BRADLEY
TYPE-RESISTOR
DESCRIPTION-EB-1084

CHART NO. 97
NO. OF SAMPLES TESTED-20




MFG.-ALLEN BRADLEY
TYPE-RESISTOR
DESCRIPTION-EB-1004

CHART NO. 96
NO. OF SAMPLES TESTED-19



| | | |
|---|---|---|
| Allen-Bradley | 1.0 MΩ ± 2% | Composition, hermetically sealed |
| CB 1054 | 250.0 V max | Tubular, axial lead |
| Resistor | | 0.375 x 0.14" diam. |

SOAK PERIOD: 16 hours at 7,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated a change greater than 10% with subsequent recovery to less than 10% change on return to 0 psig.

| | | |
|---|---|---|
| Allen-Bradley | 10 Ω ± 2% | Composition, hermetically sealed |
| RS 1004 | 2.23 V max | Tubular, axial lead |
| Resistor | 0.5 W | 0.56 x 0.255" diam. |

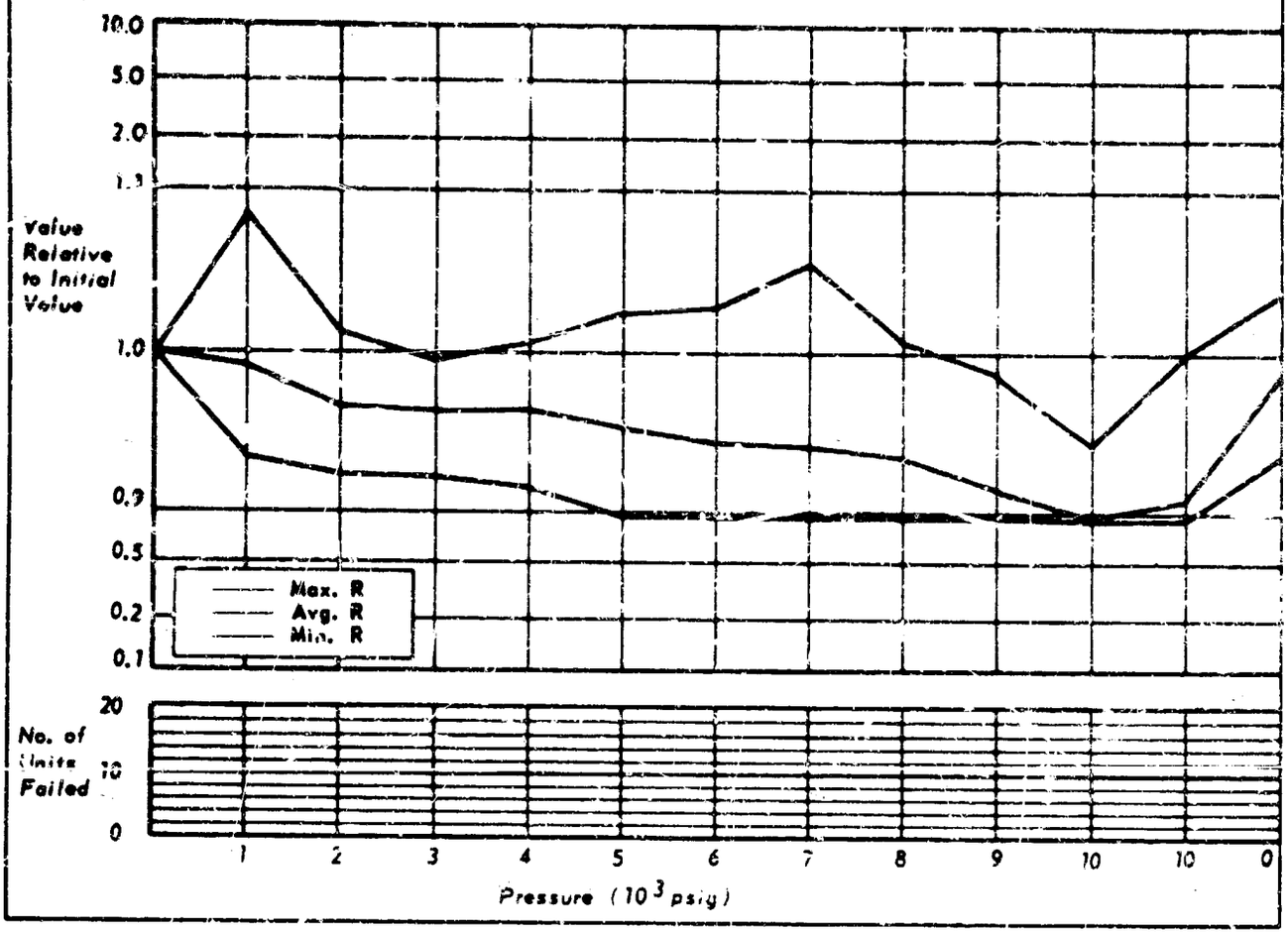
SOAK PERIOD: 16 hours at 8,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated a change greater than 10% with subsequent recovery to less than 10% change on return to 0 psig.

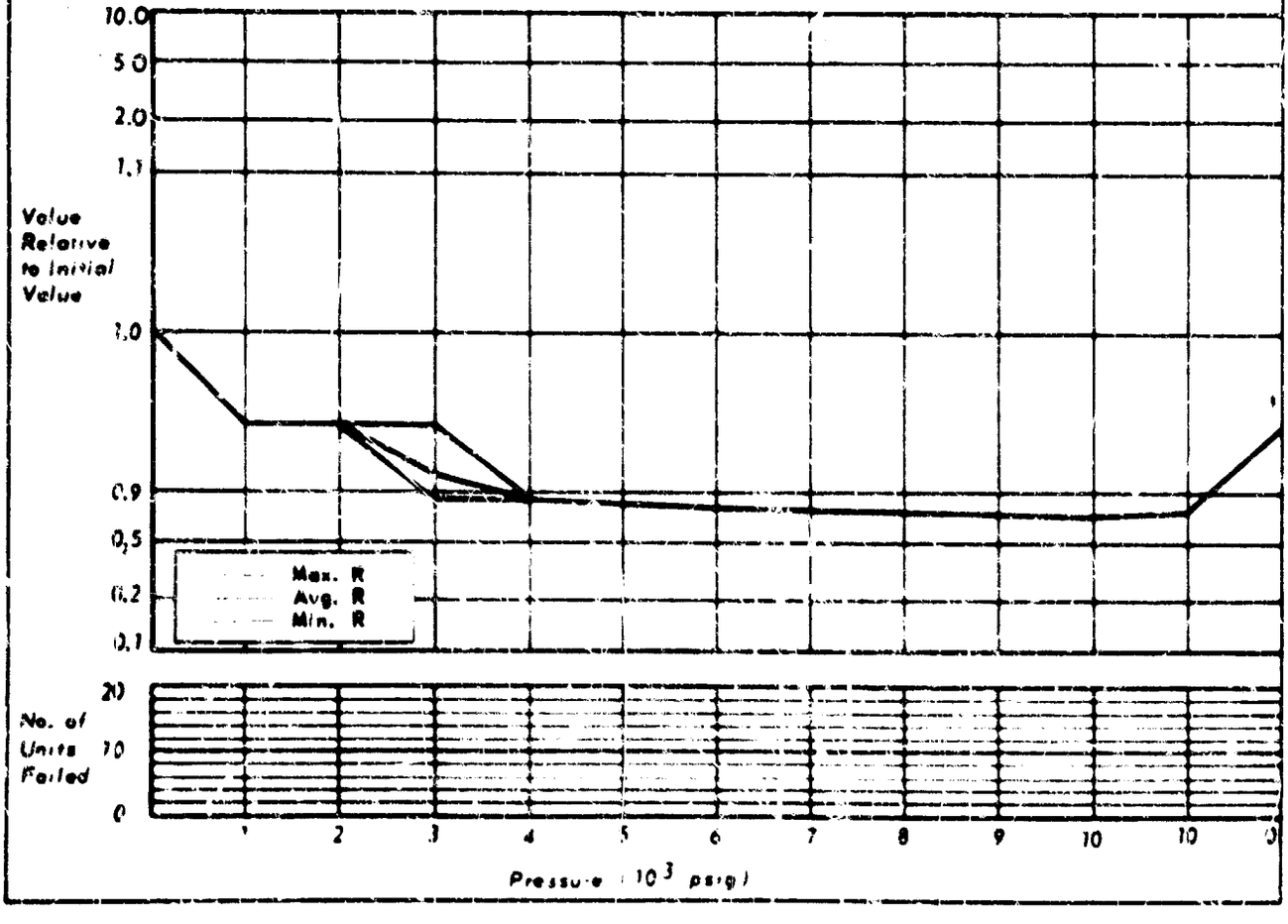
MFG.- ALLEN BRADLEY
TYPE - RESISTOR
DESCRIPTION - EB-1054

CHART NO. 99
NO. OF SAMPLES TESTED - 20




MFG.- ALLEN BRADLEY
TYPE - RESISTOR
DESCRIPTION - EB-1054

CHART NO. 100
NO. OF SAMPLES TESTED - 20



| | | | |
|---|---|---|---|
| Allen-Bradley | | 10 KΩ ± 2% | Composition, herm sealed |
| ES 1034 | | 70.71 V max | Tubular, axial lead |
| Resistor | | 0.5 W | 0.56 x 0.2[illegible]" diam. |

SOAK PERIOD: 16 hours at 8,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated a change greater than 10% with subsequent recovery to less than 10% change on return to 0 psig.

| | | | |
|---|---|---|---|
| Allen-Bradley | | 1.0 M ± 2% | Composition, herm sealed |
| ES 1054 | | 350.0 V max | Tubular, axial lead |
| Resistor | | | 0.56 x 0.225" diam. |

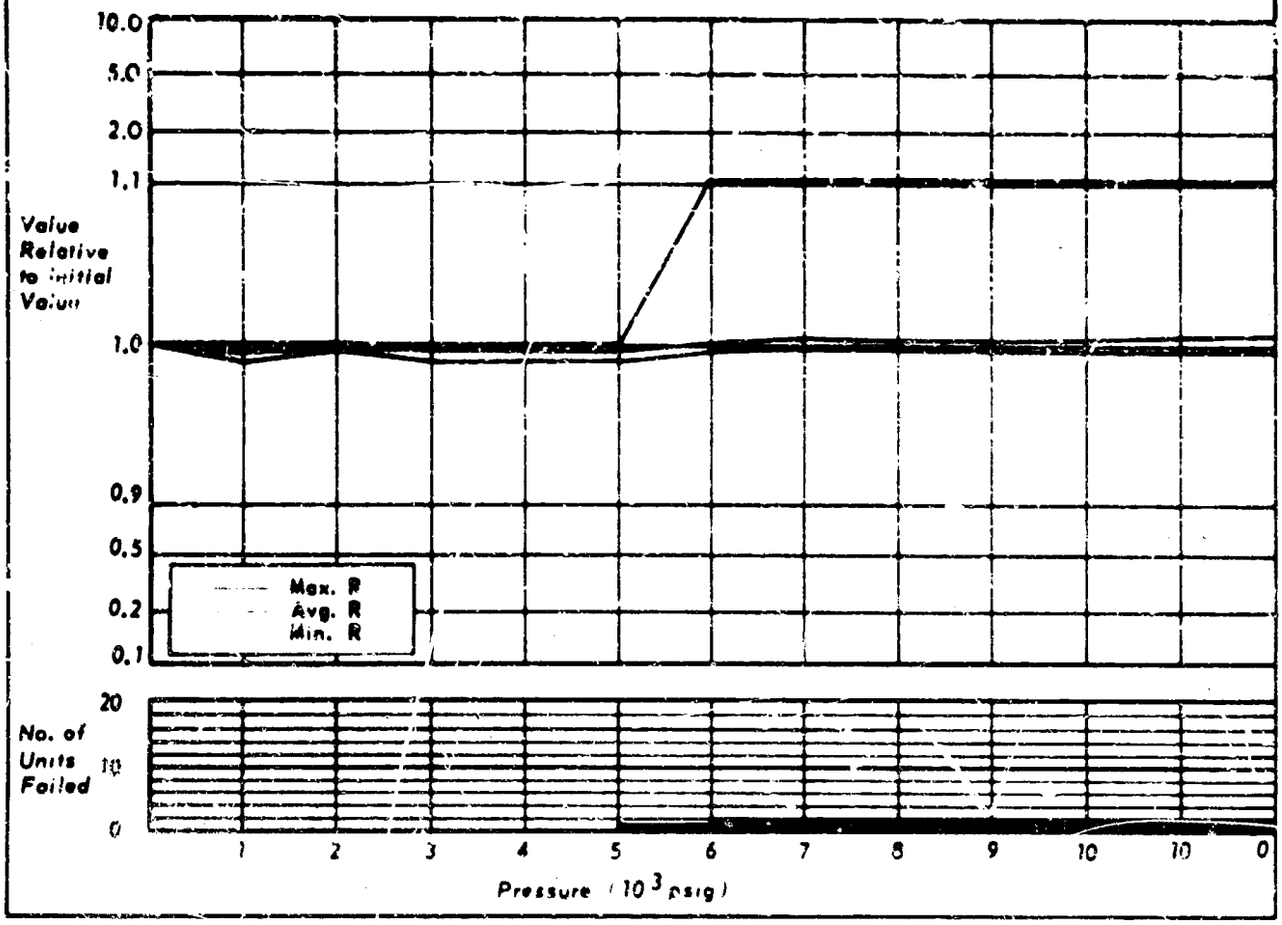
SOAK PERIOD: 16 hours at 8,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated a change greater than 10% with subsequent recovery to less than 10% change on return to 0 psig.

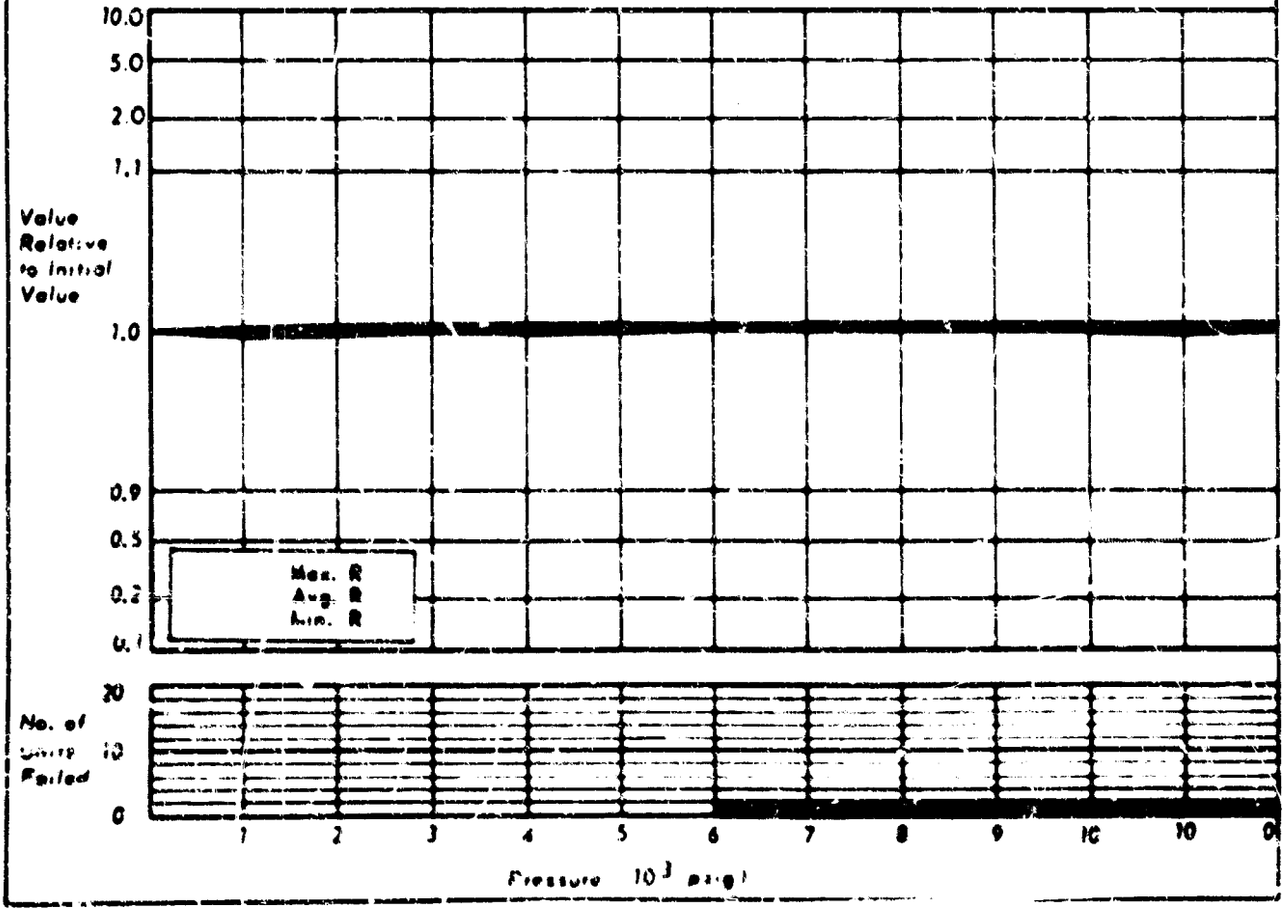
MFG. - ALLEN BRADLEY
TYPE - RESISTOR
DESCRIPTION - CA4100D0FY

CHART NO. 101
NO. OF SAMPLES TESTED - 20




MFG. - ALLEN BRADLEY
TYPE - RESISTOR
DESCRIPTION - CAN 9960 2FY

CHART NO. 102
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Allen-Bradley | 1 KΩ ± 1% | Metal film, herm sealed |
| CAH 10300 FY | 15.81 V max | Tubular, axial lead |
| Resistor | 0.25 W | 0.56 x 0.225" diam. |

SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: Eighteen components indicated less than 10% change.

FAILURES: Two components indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.

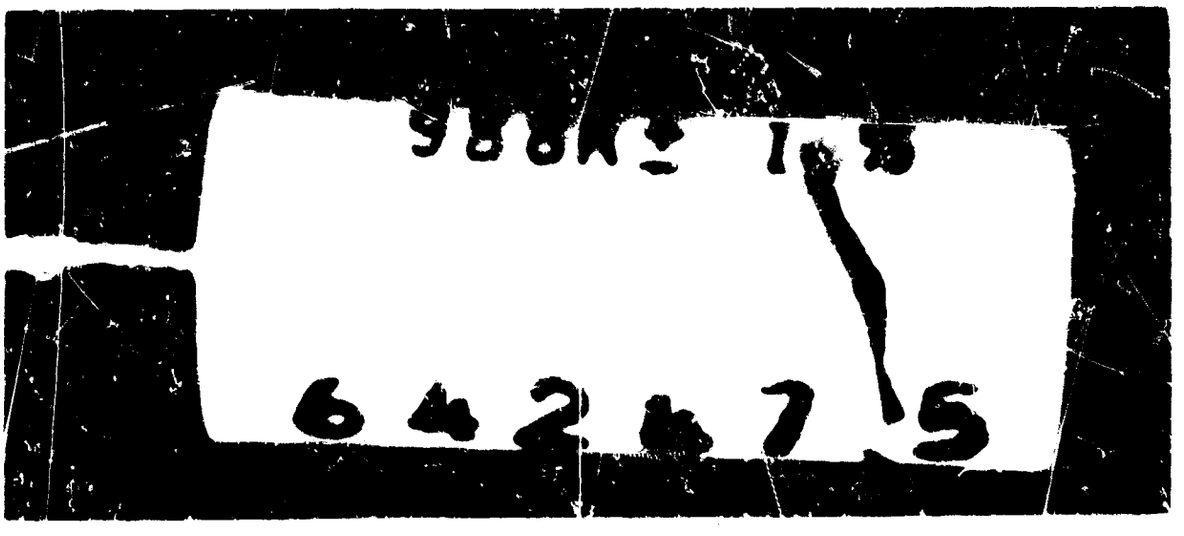
| | | |
|---|---|---|
| Allen-Bradley | 968 KΩ ± 1% | Metal film, herm sealed |
| CAH 98[illegible] FY | 300.0 V max | Tubular, axial lead |
| Resistor | 1 W | 0.56 x 0.225" diam |

SOAK PERIOD: None

MECHANICAL: Visual inspection after completion of test showed a crack in the ceramic case of one component. This component functioned normally throughout the test.

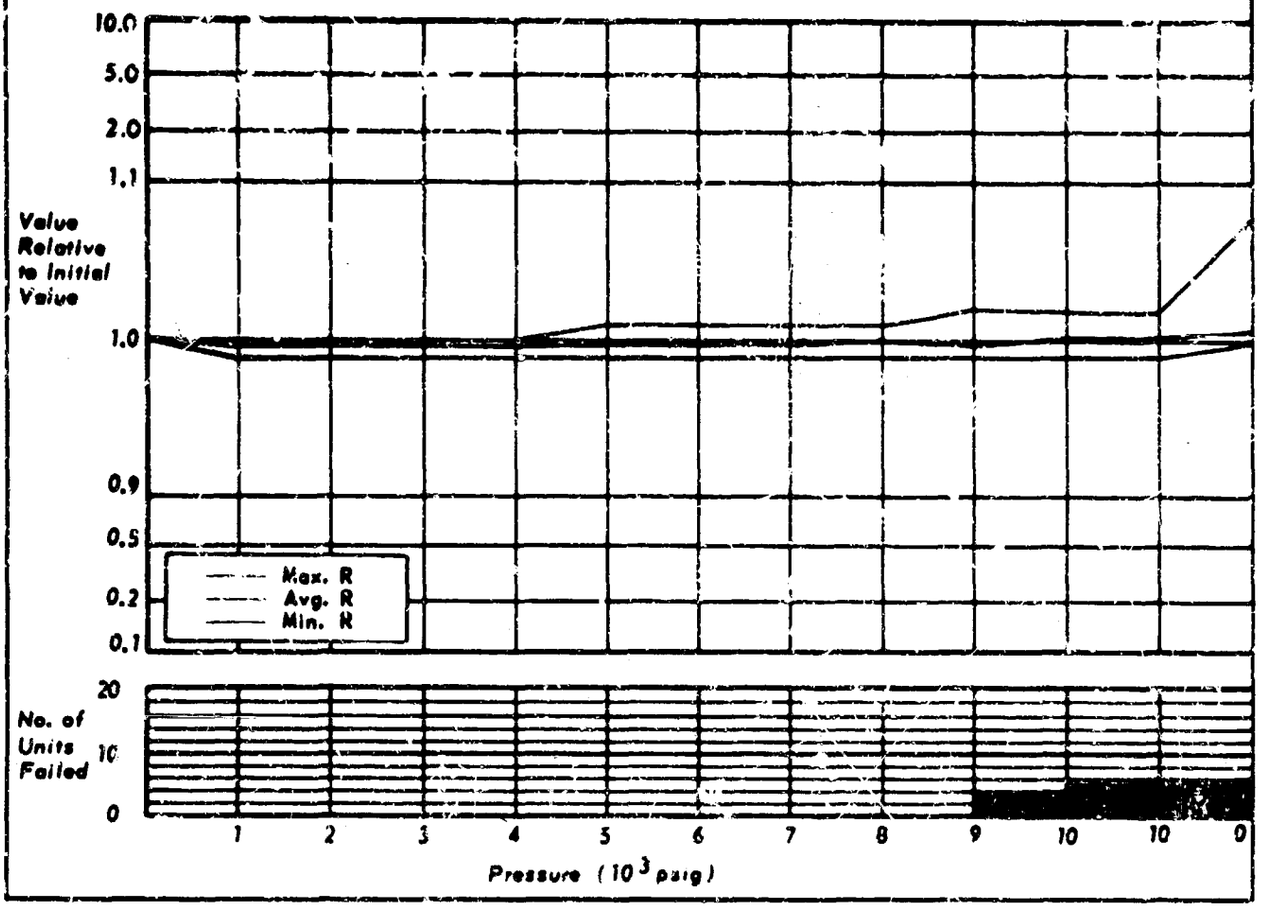
ELECTRICAL: Eighteen components indicated less than 10% change.

FAILURES: Two components indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.



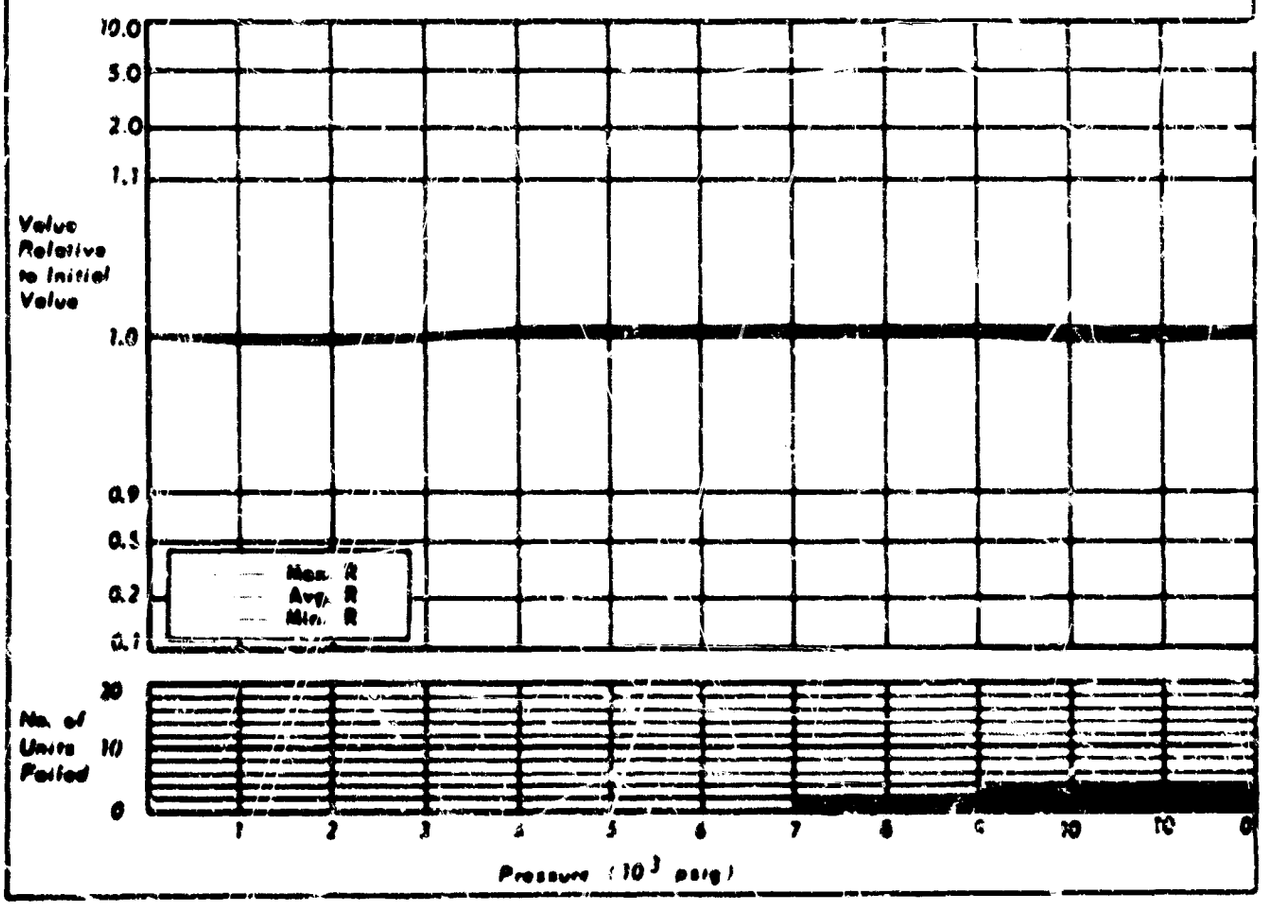
MFG. - ALLEN BRADLEY
TYPE - RESISTOR
DESCRIPTION - RAN1200(.)FY

CHART NO. 103
NO. OF SAMPLES TESTED - 19




MFG. - ALLEN BRADLEY
TYPE - RESISTOR
DESCRIPTION - RAN1000(.)FY

CHART NO. 104
NO. OF SAMPLES TESTED - 20



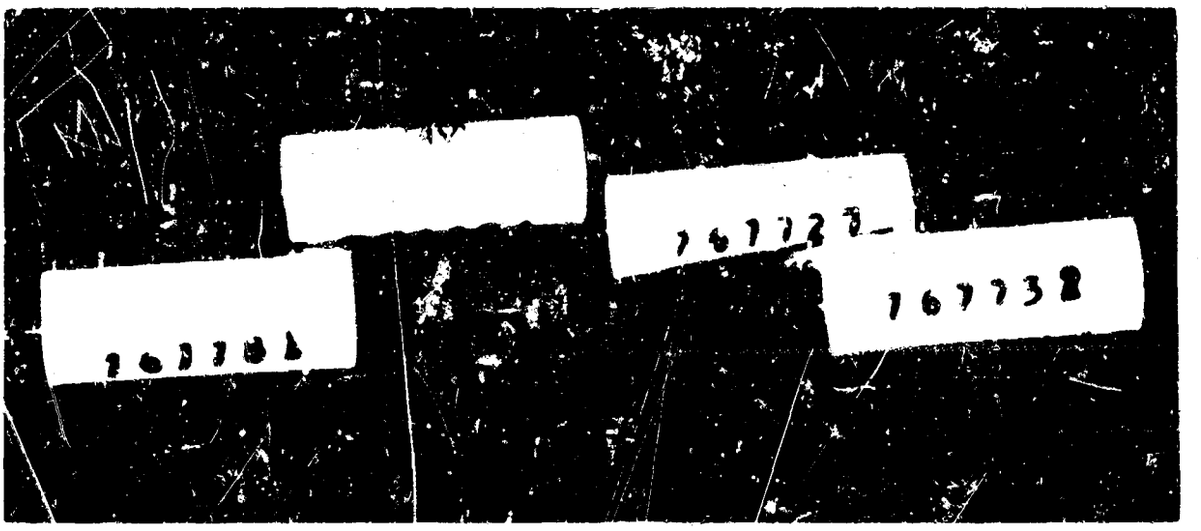
| | | |
|---|---|---|
| Allen-Bradley | 1 KΩ ± 1% | Metal film, hermetic sealed |
| EAH 10000 FY | 22.36 V max | Tubular, axial lead |
| Resistor | 0.5 W | 0.83 x 0.312" diam. |

**SOAK PERIOD:** None

**MECHANICAL:** Visual inspection following completion of tests showed cracked ceramic cases of ten components. Five of the damaged components remained functional throughout the entire test.

**ELECTRICAL:** Fourteen components indicated less than 10% change.

**FAILURES:** Five components indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.



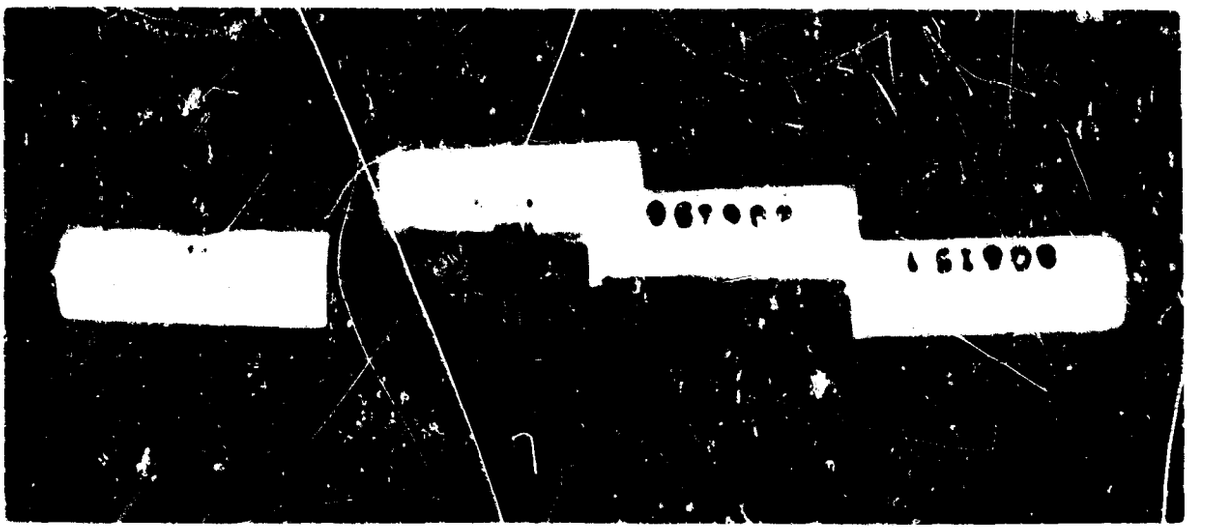
| | | |
|---|---|---|
| Allen-Bradley | 10 KΩ ± 1% | Metal film, hermetic sealed |
| EAH 10000 FY | 70.71 V max | Tubular, axial lead |
| | 0.5 W | 0.83 x 0.312" diam. |

**SOAK PERIOD:** None

**MECHANICAL:** Visual inspection following completion of tests showed cracked ceramic cases of ten components. Three of the damaged components remained functional throughout the entire test.

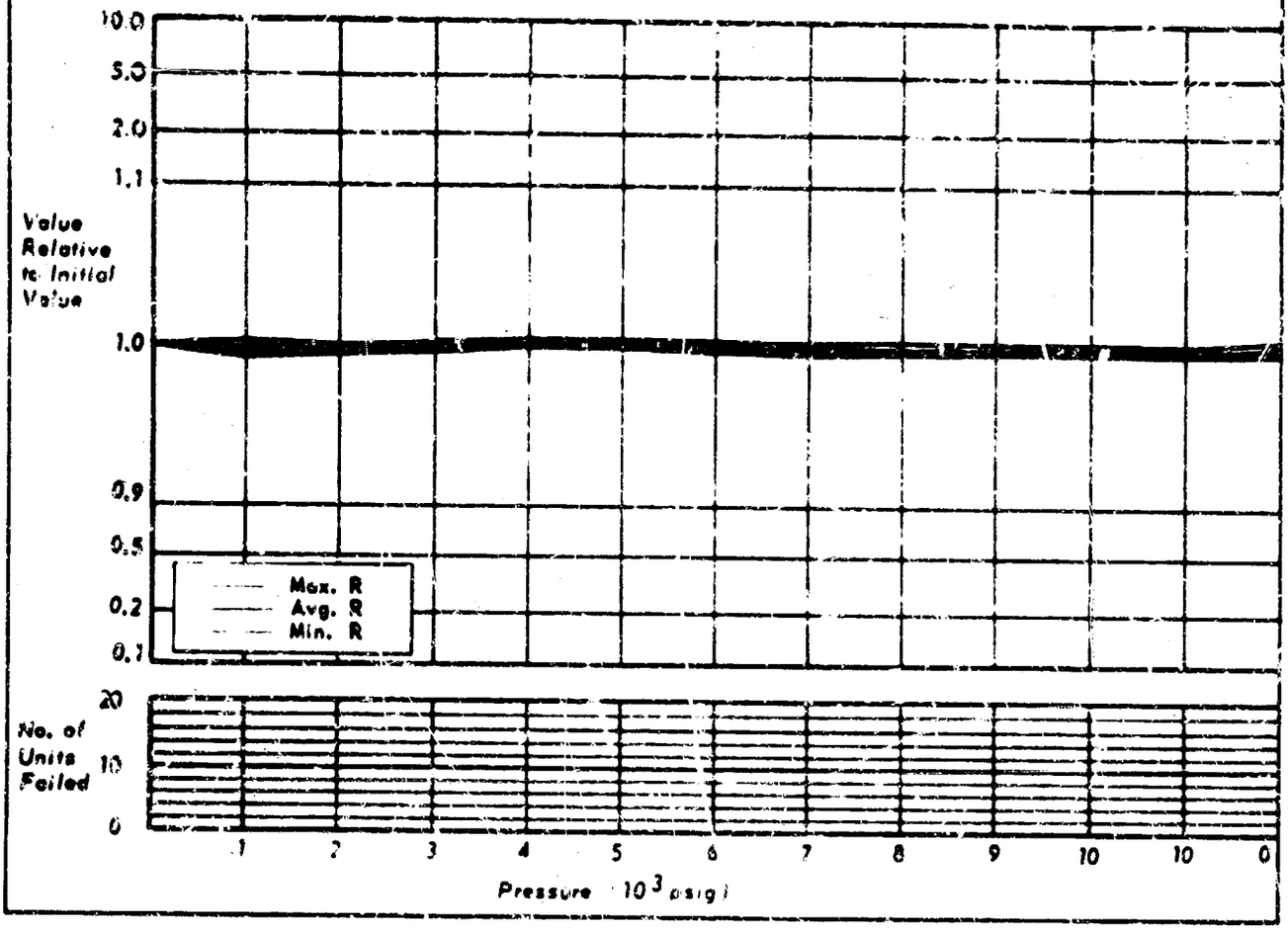
**ELECTRICAL:** Seventeen components indicated less than 10% change.

**FAILURES:** Three components indicated a permanent change greater than 50% at the pressures shown on the failure graph on opposite page.



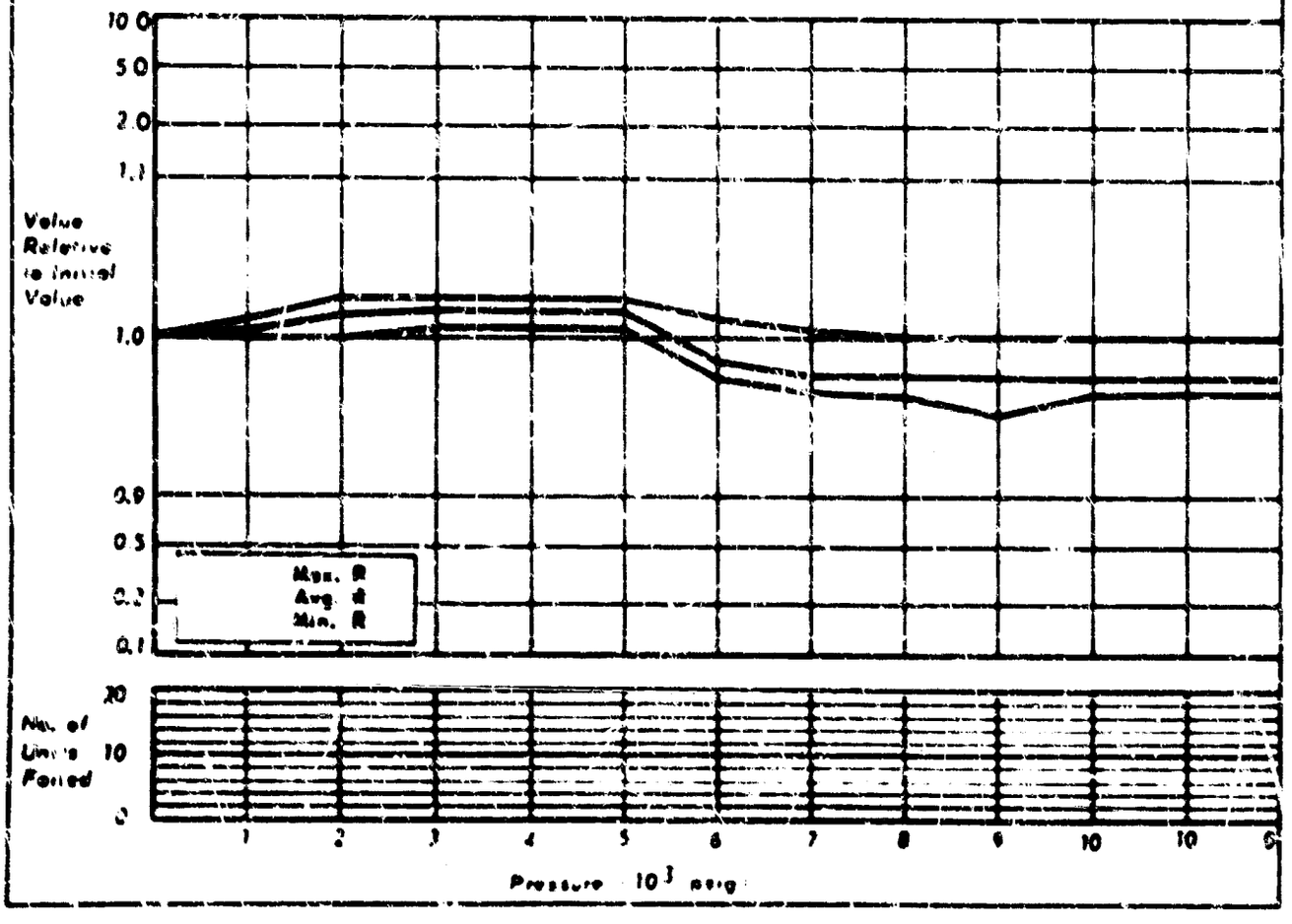
MFG. - ALLEN BRADLEY
TYPE - RESISTOR
DESCRIPTION - CAR [illegible]

CHART NO. 105
NO. OF SAMPLES TESTED - 20




MFG. - CORNING
TYPE - RESISTOR
DESCRIPTION - C[illegible] -20

CHART NO. 106
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Allen-Bradley | 10 KΩ ± 1% | Metal film, hermetic sealed |
| CAH10000 1FY | 300 V max | Tubular, axial lead |
| Resistor | 1W | 0.33 x 0.312" diam. |

SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

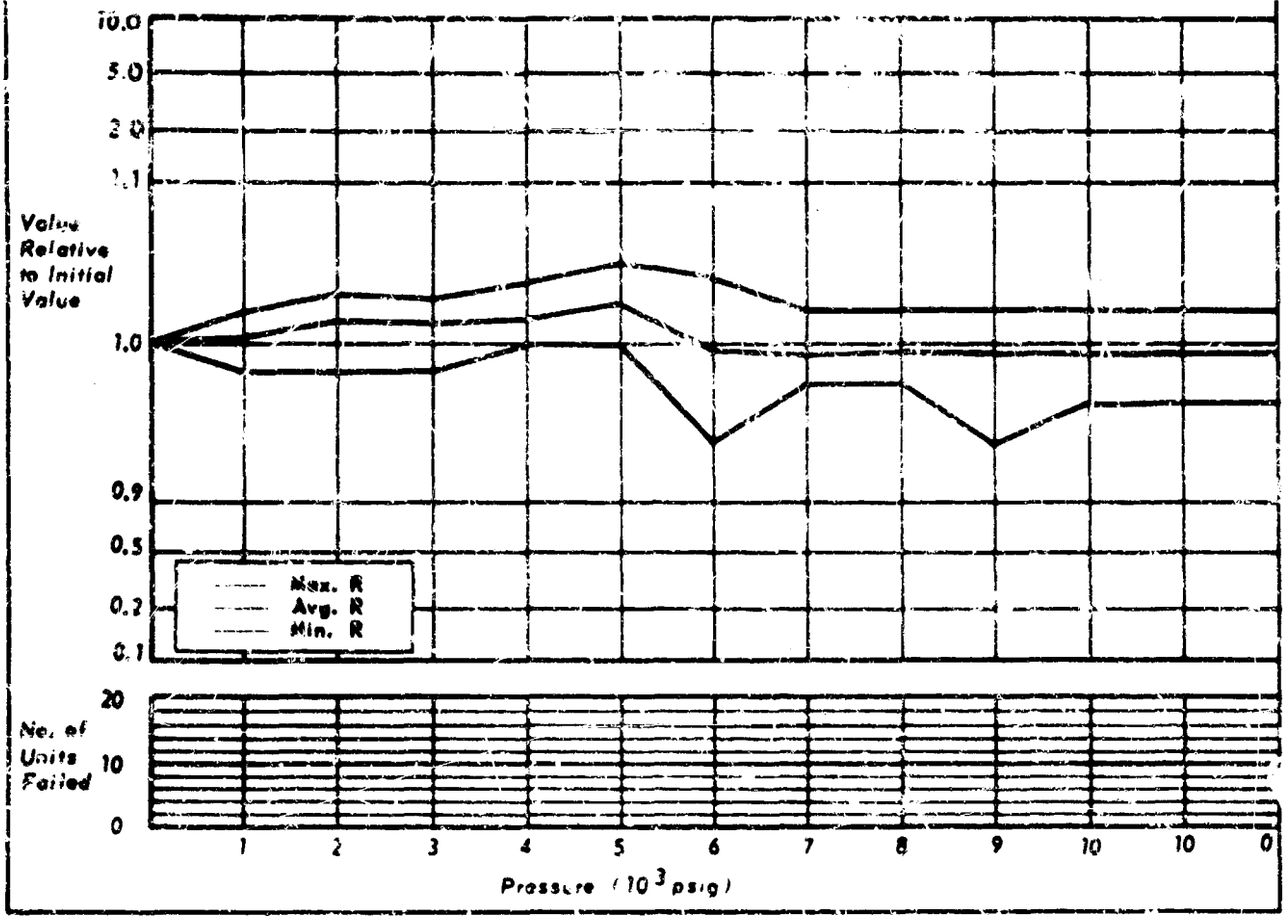
| | | |
|---|---|---|
| Corning | 209 Ω & 470 KΩ | Experimental |
| CT-20 | | |
| Resistor | | |

SOAK PERIOD: None

MECHANICAL: All components indicated less than 10% change.

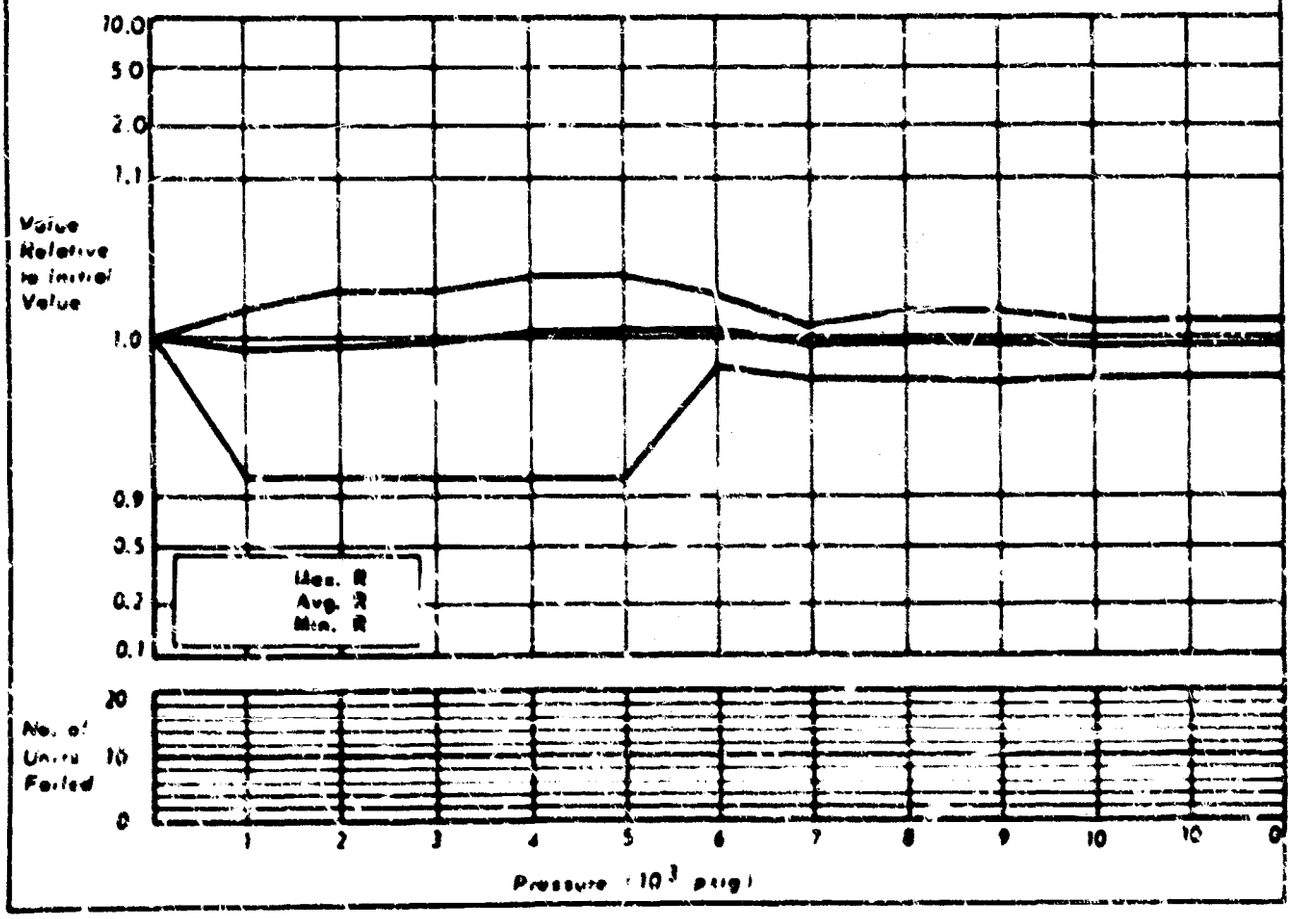
MFG.-CORNING
TYPE-RESISTOR
DESCRIPTION-RA-65

CHART NO. 107
NO. OF SAMPLES TESTED-20




MFG.-CORNING
TYPE-RESISTOR
DESCRIPTION-RA-80

CHART NO. 108
NO. OF SAMPLES TESTED-20



Corning — See Note — Silicone-epoxy coat

NA-65 — Tubular, axial lead

Resistor

NOTE: Nine different values of the NA-65 type resistor were submitted for test. Since all components were of the same type the twenty components were tested as a set. The values and numbers submitted are listed below.

| Value | Quantity | Value | Quantity |
|---|---|---|---|
| 10.0 Ω | 2 | 255 KΩ | 2 |
| 14.7 Ω | 2 | 499 KΩ | 2 |
| 30.6 Ω | 2 | 51.1 Ω | 3 |
| 100.0 Ω | 2 | 100.0 KΩ | 3 |
| 10 KΩ | 2 | | |

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

Corning — See Note — Silicone-epoxy coat

NA-60 — Tubular, axial lead

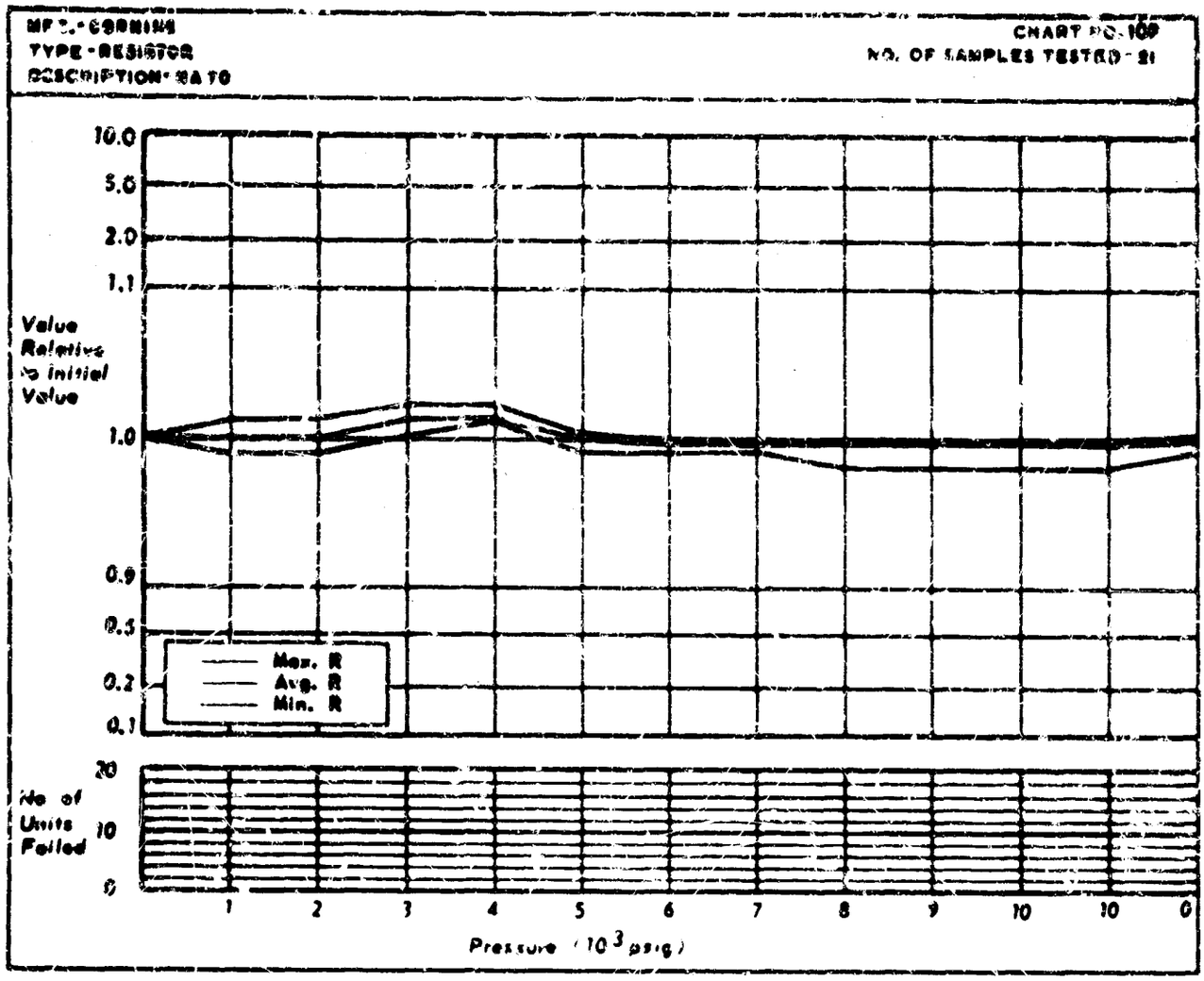
Resistor

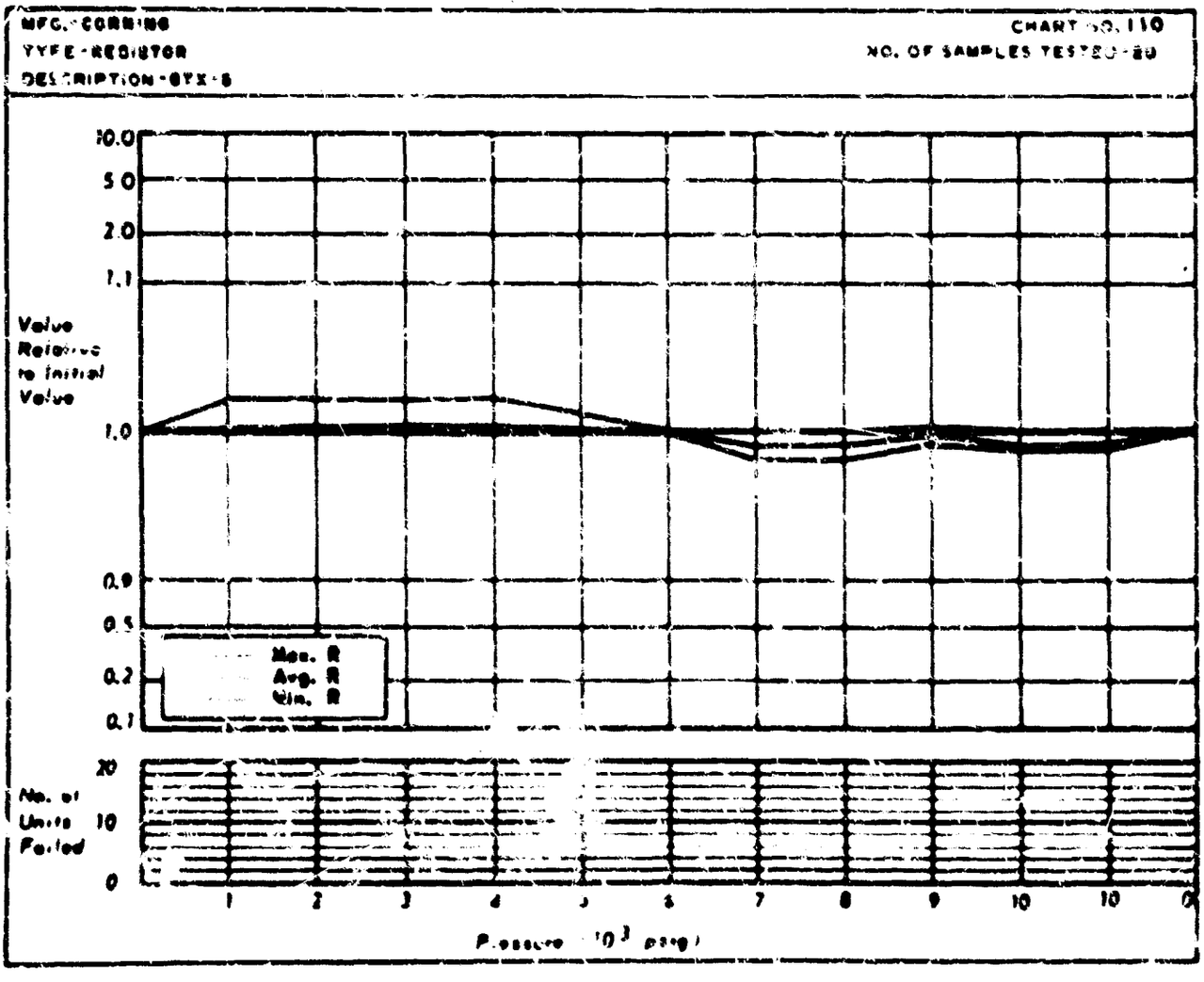
NOTE: Nine different values of the NA-65 type resistor were submitted for test. Since all components were of the same type the twenty components were tested as a set. The values and numbers submitted are listed below.

| Value | Quantity | Value | Quantity |
|---|---|---|---|
| 10.0 Ω | 3 | 100 KΩ | 3 |
| 23.7 Ω | 3 | 150 KΩ | 3 |
| 51.1 Ω | 3 | 82.5 Ω | 2 |
| 100.0 Ω | 3 | | |

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.


MFG.-CORNING
TYPE-RESISTOR
DESCRIPTION-RA 70
CHART NO. 109
NO. OF SAMPLES TESTED-21
10.0
5.0
2.0
1.1
Value Relative to Initial Value
1.0
0.9
0.5
0.2
0.1
Max. R
Avg. R
Min. R
20
10
0
No. of Units Failed
1
2
3
4
5
6
7
8
9
10
10
0
Pressure (10³ psig)


MFG.-CORNING
TYPE-RESISTOR
DESCRIPTION-RNC-5
CHART NO. 110
NO. OF SAMPLES TESTED-80
10.0
5.0
2.0
1.1
Value Relative to Initial Value
1.0
0.9
0.5
0.2
0.1
Max. R
Avg. R
Min. R
20
10
0
No. of Units Failed
1
2
3
4
5
6
7
8
9
10
10
0
Pressure (10³ psig)

| | | |
|---|---|---|
| Corning | See Note | Metal film, epoxy coat |
| MA-70 | 0.5 W | Tubular, axial lead |
| Resistor | | 0.70 x 0.28" diam. |

NOTE: Three components of each of the seven values listed below were submitted. All components were of the same type and were therefore tested as a set of twenty one.

84.5 Ω 1 KΩ 100 KΩ 1 MΩ
100.0 Ω 10 KΩ 499 KΩ

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Corning | See Note | Tin oxide film, glass coat |
| GTX-3 | 0.25 W | Tubular, axial lead |
| Resistor | | 0.34 x 0.15" diam. |

NOTE: Ten components of each of the two values listed below were submitted for test. All components were of the same type and were therefore tested as a set of twenty.

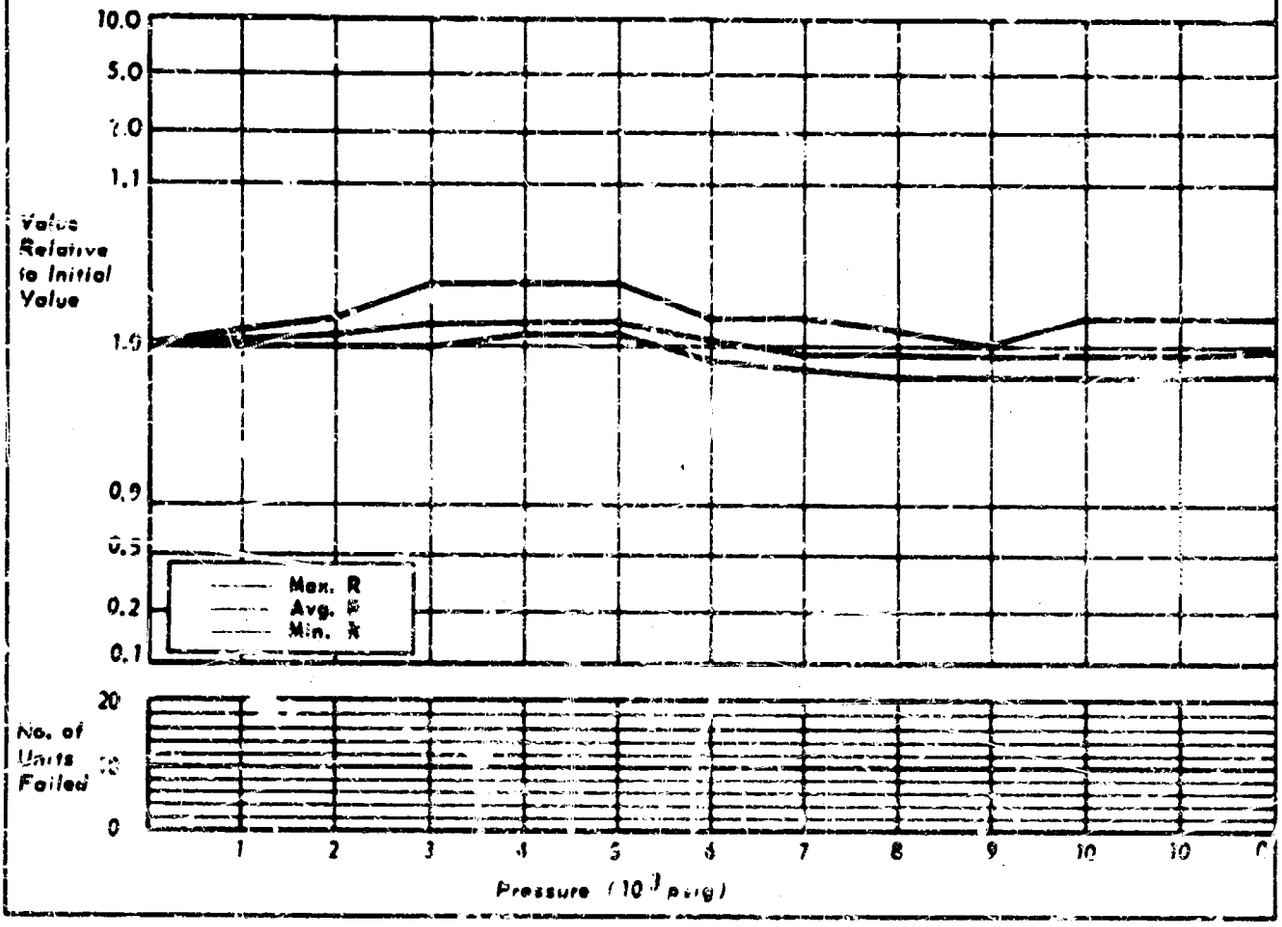
49.9 Ω
50 KΩ

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

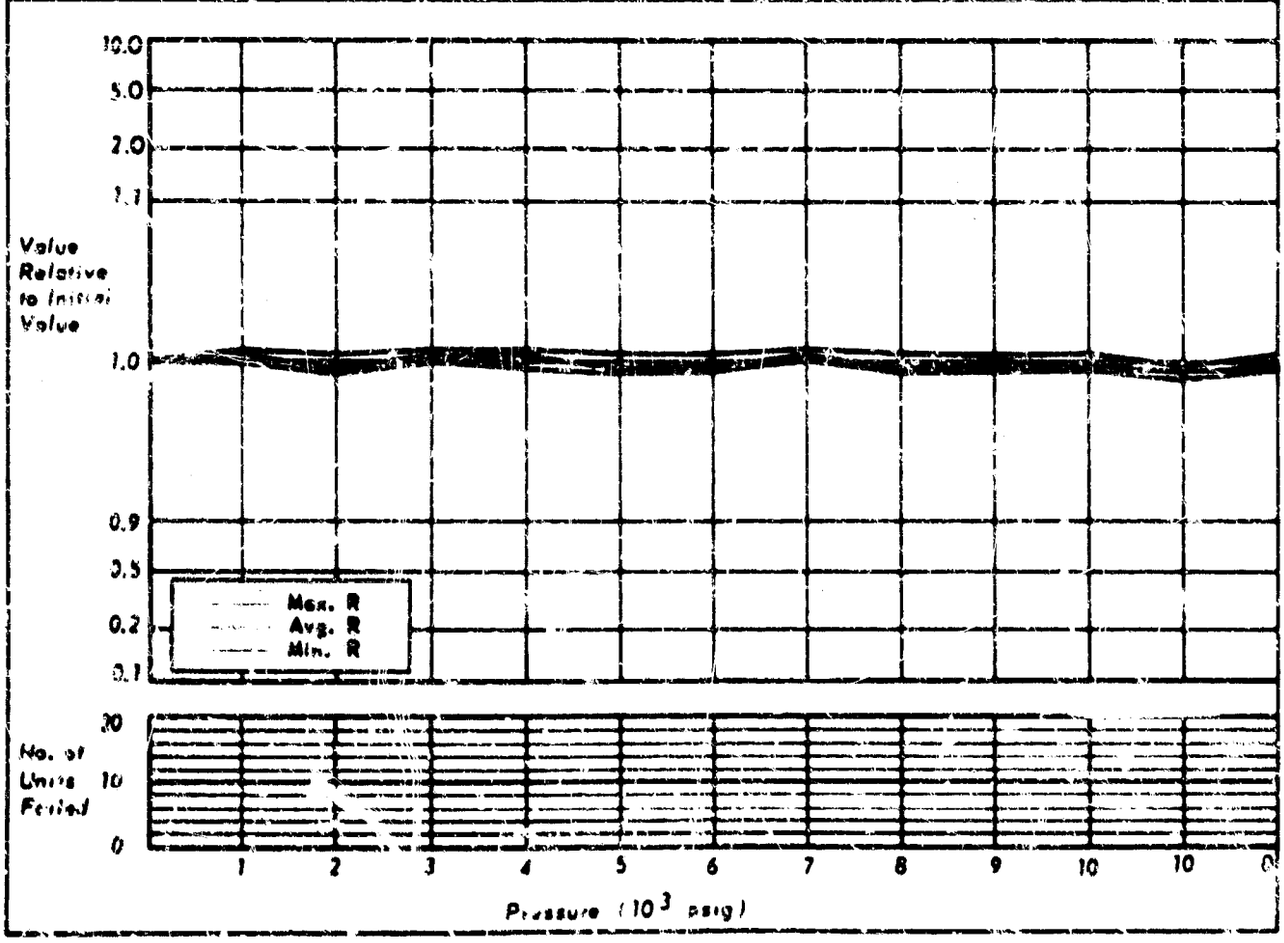
MFG. - CORNICS
TYPE - RESISTOR
DESCRIPTION - RA - 88

CHART NO. 111
NO. OF SAMPLES TESTED - 21




MFG. - DALE ELECTRONICS
TYPE - RESISTOR
DESCRIPTION - T - 2 MFC

CHART NO. 112
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Corning | See Note | Metal film, epoxy coat |
| NA-55 | 0.125 W | Tubular, axial lead |
| Resistor | | 0.62 x 0.187" diam. |

NOTE: Three components of each the seven resistance values listed below were submitted. All were NA-55 type and were therefore tested as a set of twenty one.

| | | | |
|---|---|---|---|
| 51 Ω | 100 Ω | 10 KΩ | 130 KΩ |
| 75 Ω | 150 Ω | 100 KΩ | |

MECHANICAL: No apparent damage

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Dale | See Note | Metal film, epoxy coat |
| T-2 MFS-½ | 0.5 W | Tubular, axial lead |
| Resistor | | 0.70 x 0.25" diam |

NOTE: Twenty components of three different resistance values were submitted. All were T-2 MFS-½ type and were therefore tested as a set. The values and quantity of each value are listed below.

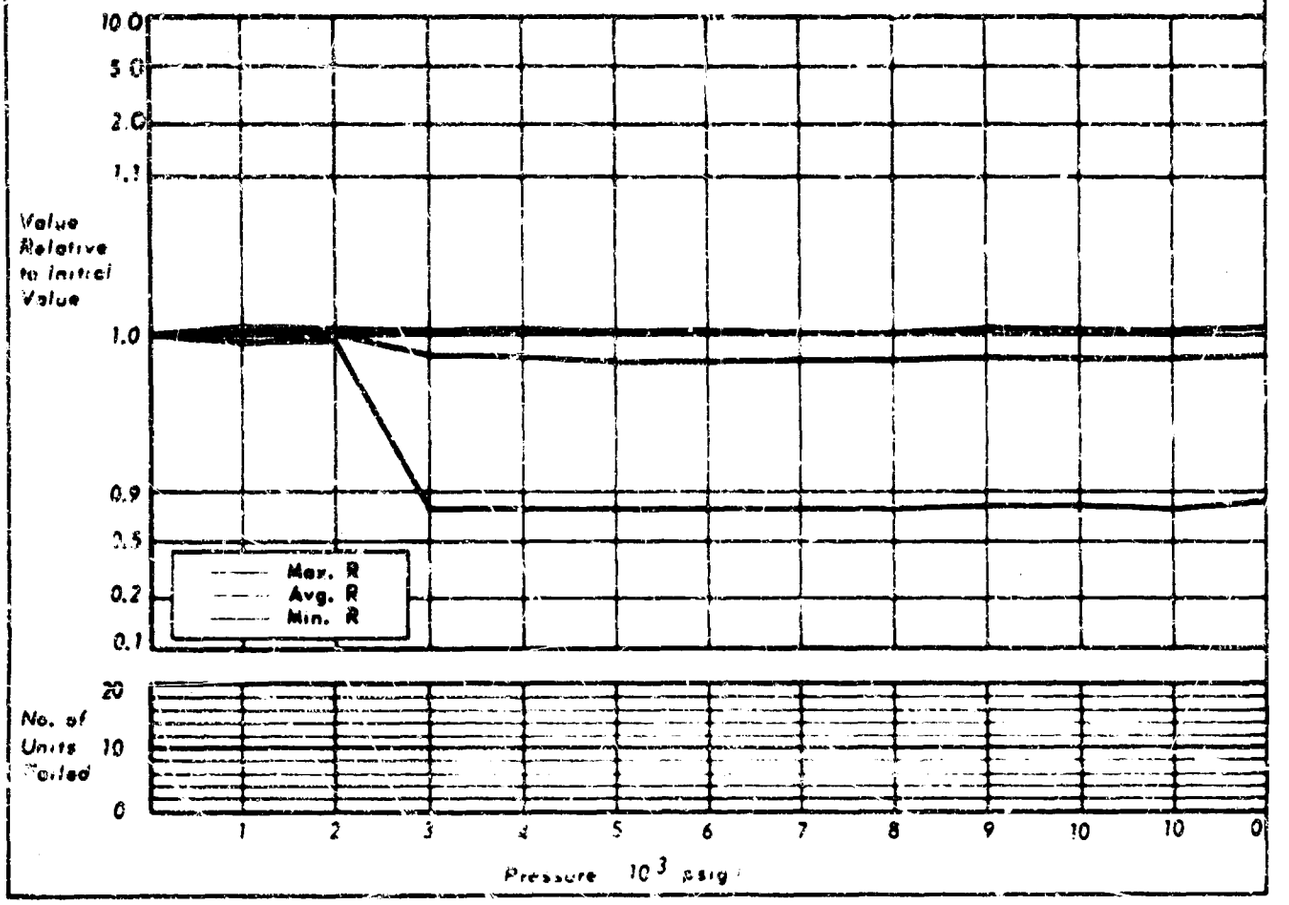
| Value | Quantity |
|---|---|
| 100 Ω | 5 |
| 250 KΩ | 10 |
| 1 MΩ | 5 |

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

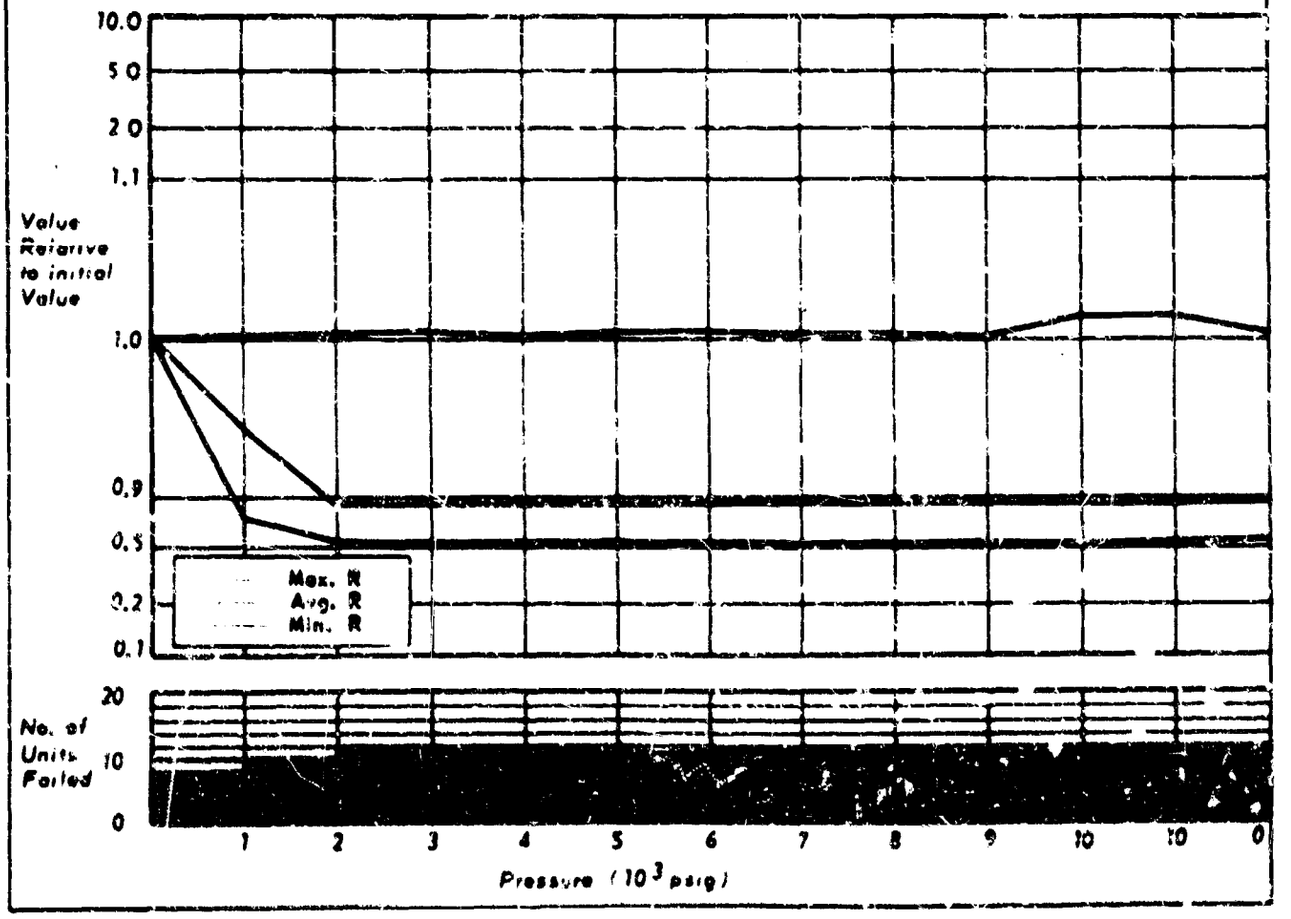
MFG - GENERAL INSTRUMENT
TYPE - RESISTOR
DESCRIPTION - SIR-IC

CHART NO. 113
NO. OF SAMPLES TESTED - 20




MFG. - GENERAL INSTRUMENT
TYPE - RESISTOR
DESCRIPTION - SIR-S

CHART NO. 114
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| General Instruments | 20 K ± 0.02% | Wire wound |
| R10 | 0.5 W | Sealed, metal cap |
| Resistor | | Tubular, axial lead |
| | | 0.45 x 0.28" diam. |

SOAK PERIOD: 16 hours at 9,000 psig.

MECHANICAL: Visual inspection after completion of test showed the metal case of two components were deformed and the end seal of one component cracked and separated from the case. All damaged units functioned normally through the entire test program.

ELECTRICAL: SO Nineteen components indicated less than 10% change. One component indicated less than 50% and greater than 10% change.

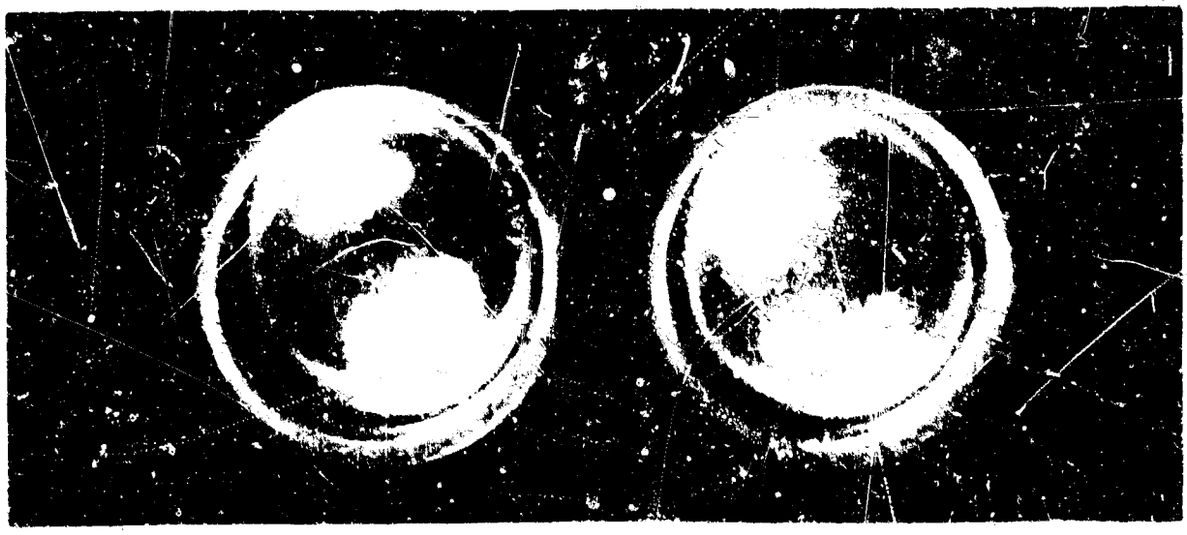
| | | |
|---|---|---|
| General Instruments | 5 KΩ ± 0.05% | Wire wound |
| R5 | 0.5 W | Sealed, metal cap |
| Resistor | | Pill box, parallel lead |
| | | 0.30 x 0.34" diam. |

SOAK PERIOD: 16 hours at 9,000 psig.

MECHANICAL: Visual inspection after completion of test showed the top of all metal caps were deformed.

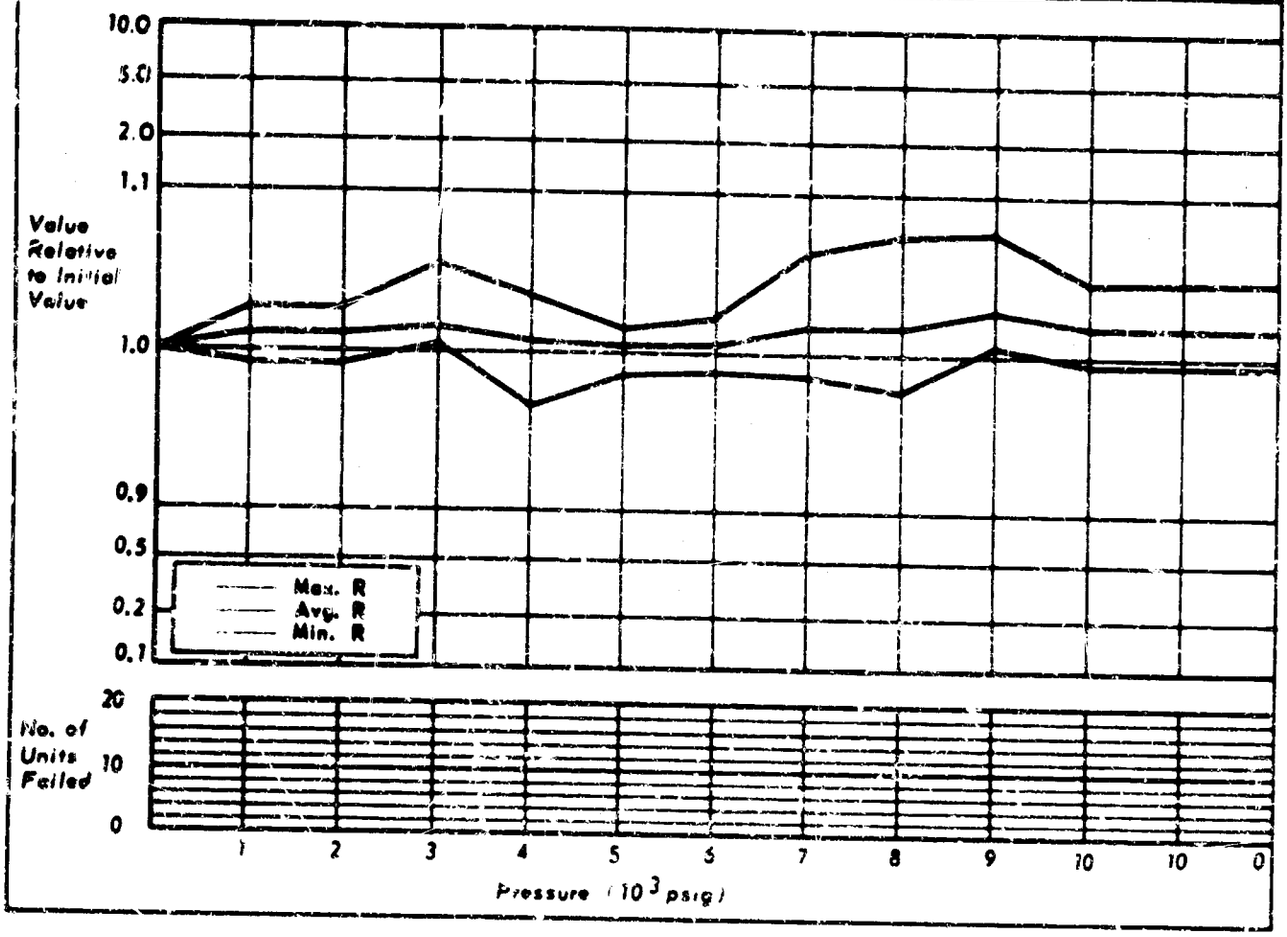
ELECTRICAL: Four components varied less than 5% and two varied more than 30% and less than 50%.

FAILURES: Thirteen components indicated a change greater than 50%.



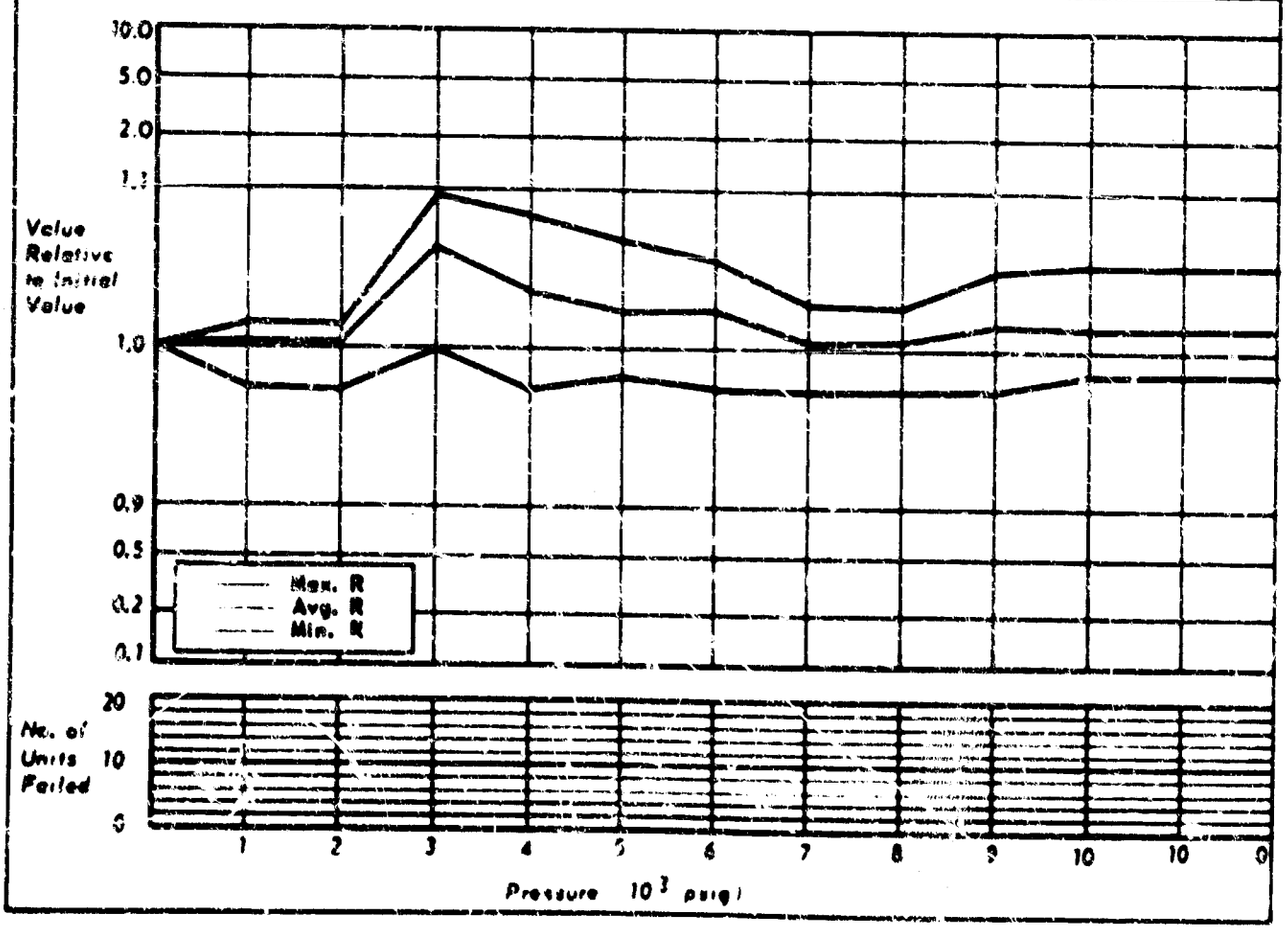
MFG.-ONMITE
TYPE-RESISTOR
DESCRIPTION-884-1A

CHART NO. 115
NO. OF SAMPLES TESTED-19




MFG.-ONMITE
TYPE-RESISTOR
DESCRIPTION-88X-8

CHART NO. 116
NO. OF SAMPLES TESTED-20



| | | |
|---|---|---|
| Ohmite | 4 Ω ± 1% | Wire wound, silicon mold |
| 884-1A | 1.5 W | Tubular, axial lead |
| Resistor | | 0.406 x 0.125" diam. |

SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Ohmite | 5 Ω ± 5% | Wire wound, silicon mold |
| 88x-5 | 5 W | Tubular, axial lead |
| Resistor | | 0.875 x 0.34" diam. |

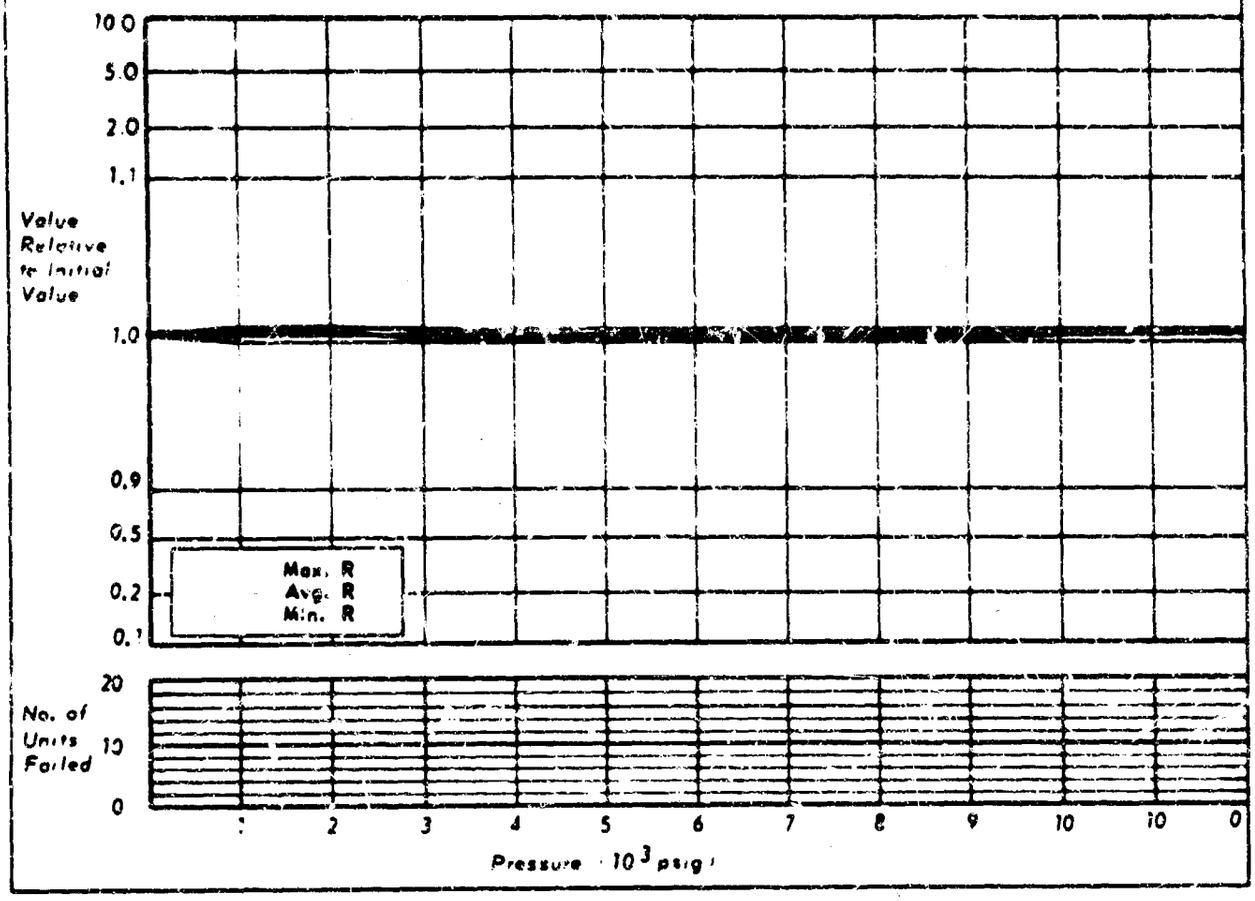
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

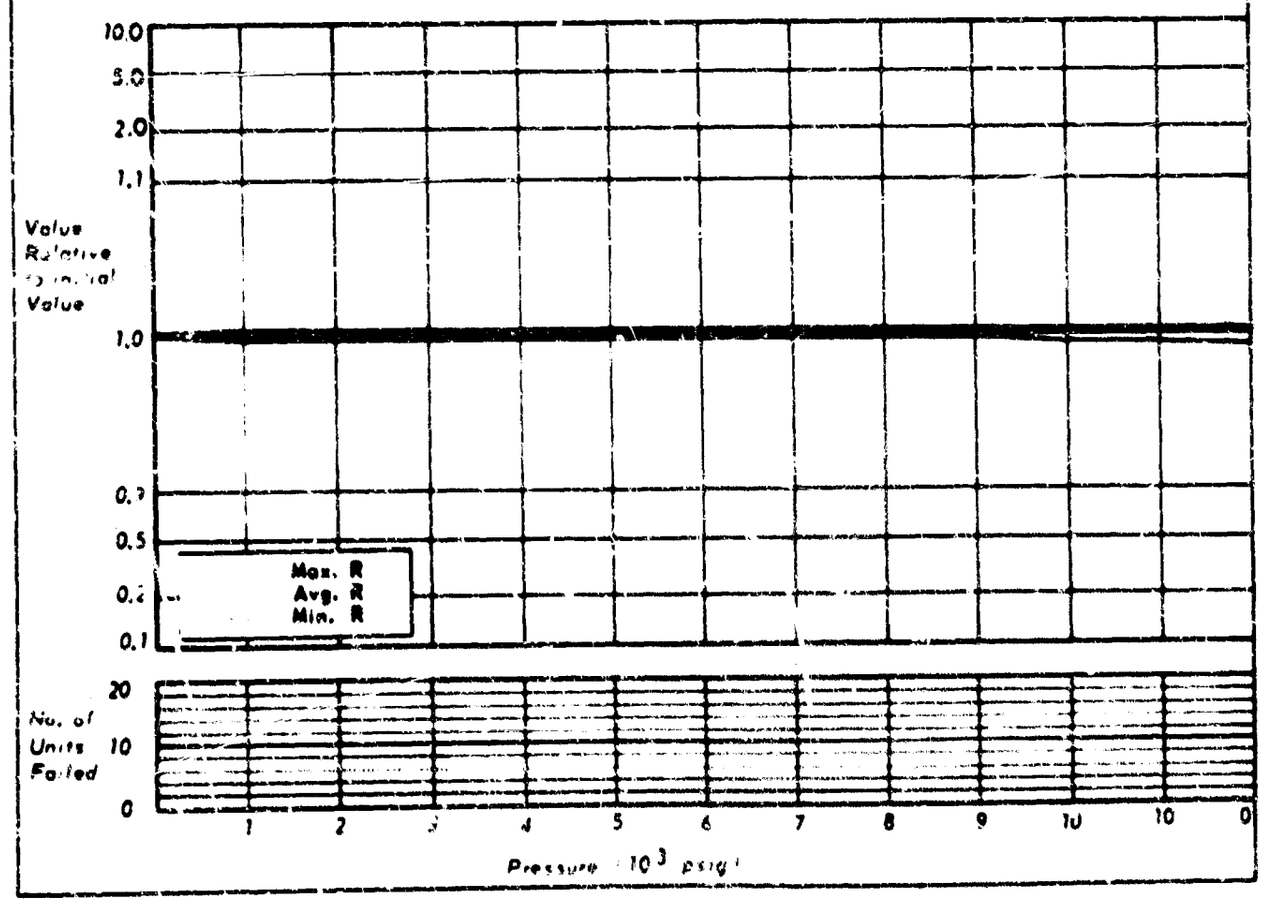
MFG. - OHMITE
TYPE - RESISTOR
DESCRIPTION - 281-11

CHART NO. 117
NO. OF SAMPLES TESTED - 19




MFG. - OHMITE
TYPE - RESISTOR
DESCRIPTION - 882-1A

CHART NO. 118
NO. OF SAMPLES TESTED - 19



| | | |
|---|---|---|
| Ohmite | 14 Ω ± 3% | Wire wound, silicon mold |
| 881-11 | 11W | Tubular, axial lead |
| Resistor | | 1.312 x 0.625" diam. |

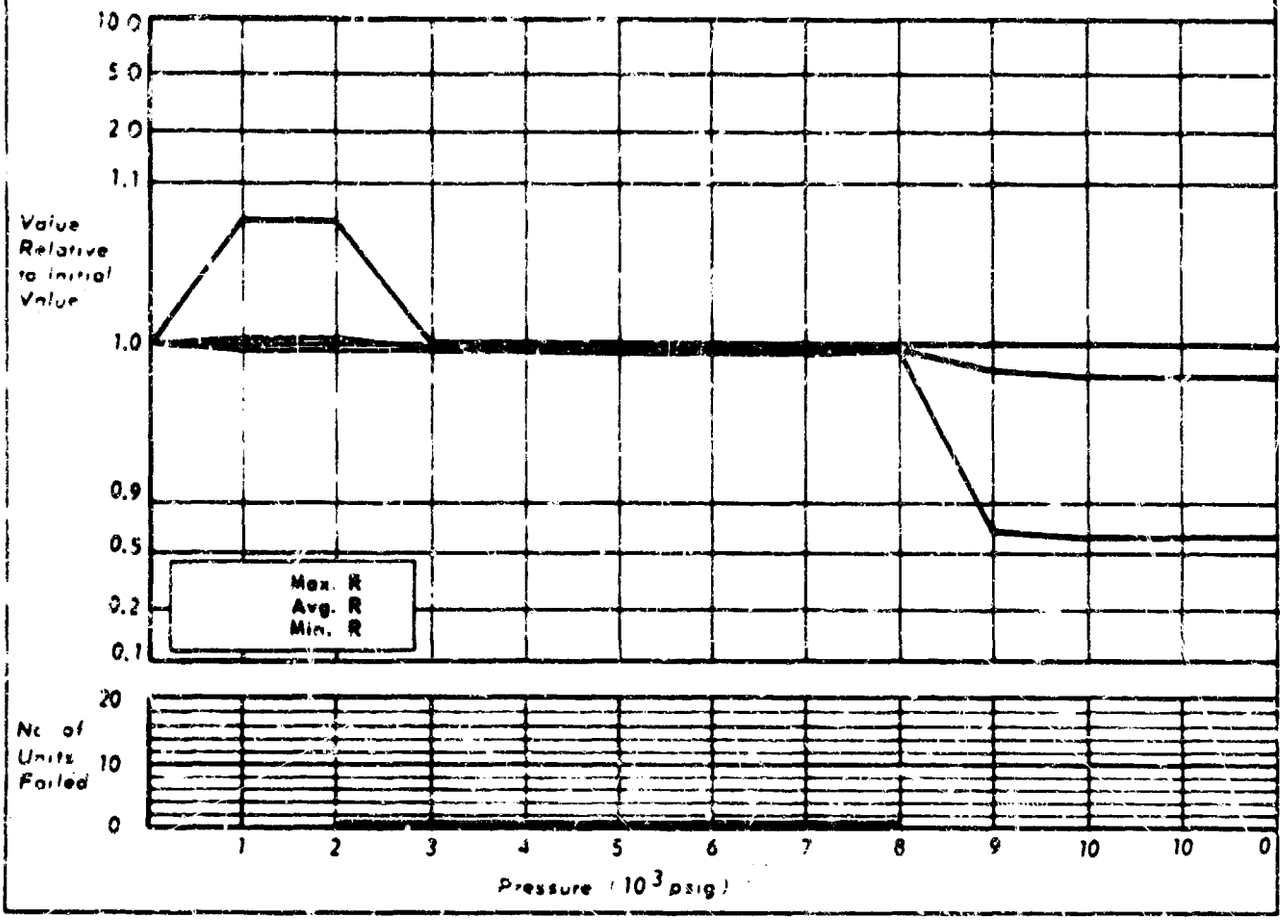
SOAK PERIOD: None
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Ohmite | 2.5 KΩ ± 3% | Wire wound, silicon mold |
| 882-1A | 1 W | Tubular, axial lead |
| Resistor | | 0.406 x 0.125" diam. |

SOAK PERIOD: None
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

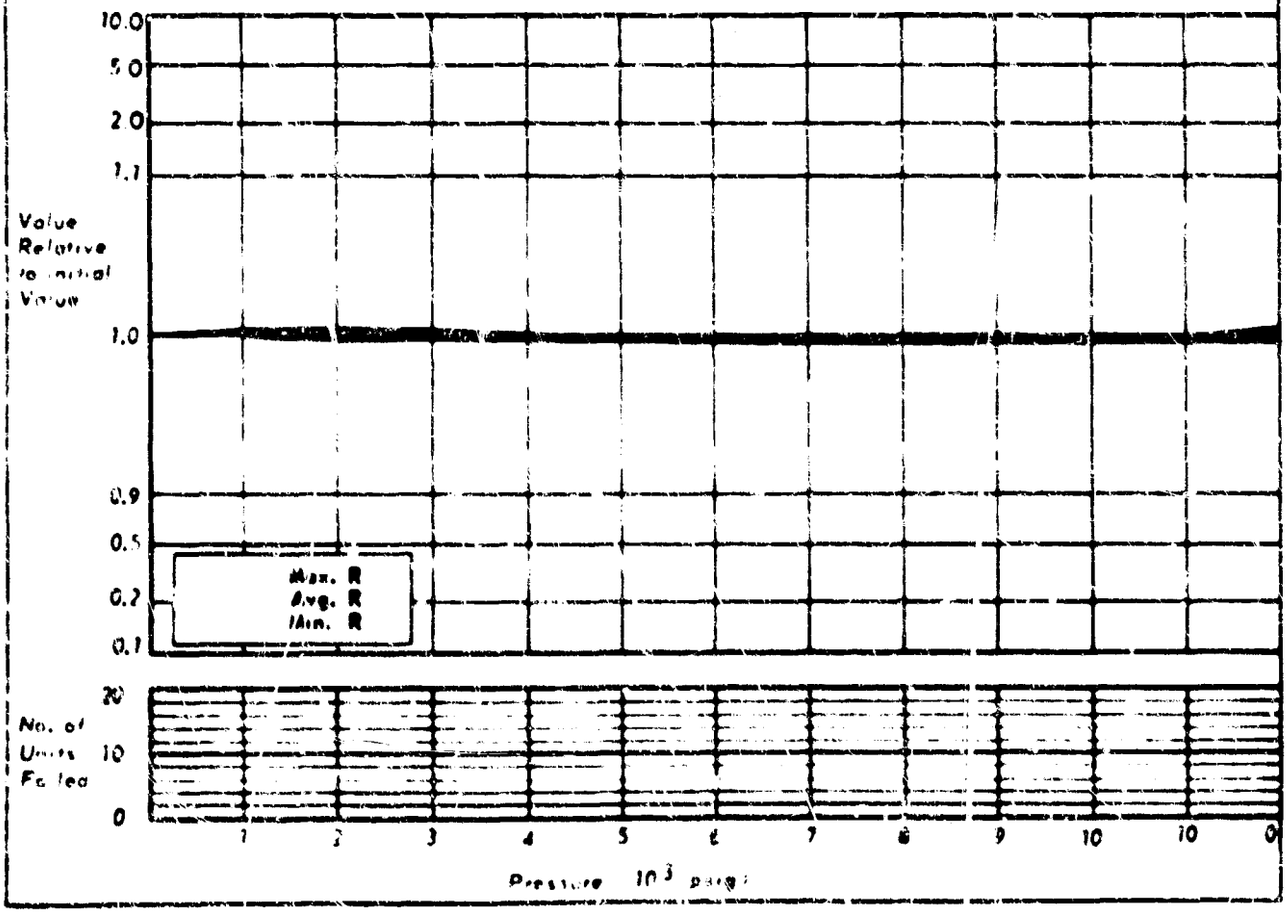
MFG. - GHMITE
TYPE - RESISTOR
DESCRIPTION - 884-8

CHART NO. 119
NO. OF SAMPLES TESTED - 20




MFG. - GHMITE
TYPE - RESISTOR
DESCRIPTION - 884-10

CHART NO. 120
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Ohmite | 51.1 KΩ ± 1% | Wire wound silicon mold |
| 884-5 | 5 W | Tubular, axial lead |
| Resistor | | 0.875 x 0.34" diam. |

SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: Nineteen components indicated less than 10% change.

FAILURES: One component indicated a change greater than 50% with subsequent recovery to less than 50% at the pressures shown on the failure graph on facing page.

| | | |
|---|---|---|
| Ohmite | 84.5 KΩ ± 1% | Wire wound, silicon mold |
| 884-10 | 5 W | Tubular, axial lead |
| Resistor | | 1.312 x 0.625" diam. |

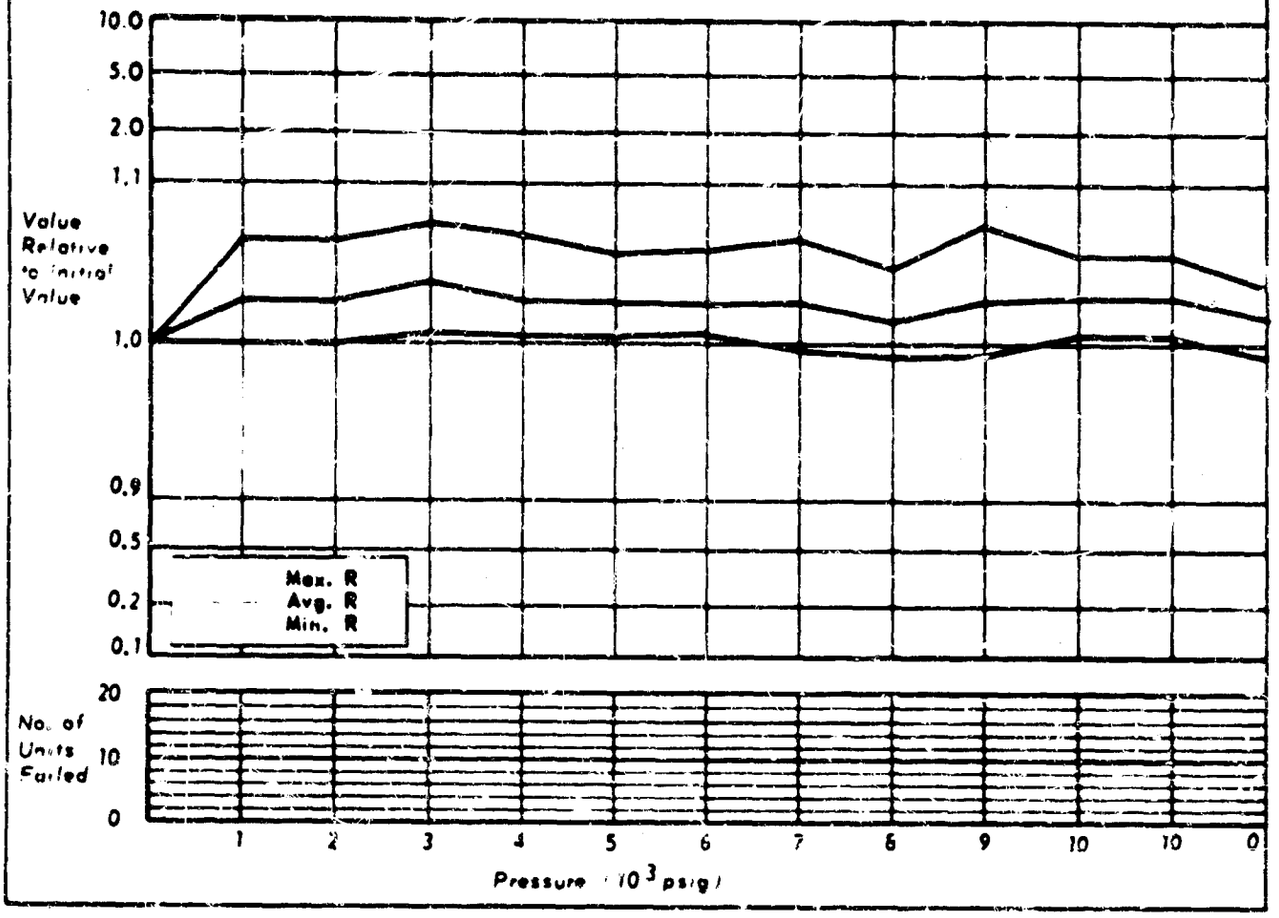
SOAK PERIOD: 15.5 hours at 10,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: Twenty components indicated less than 19% change.

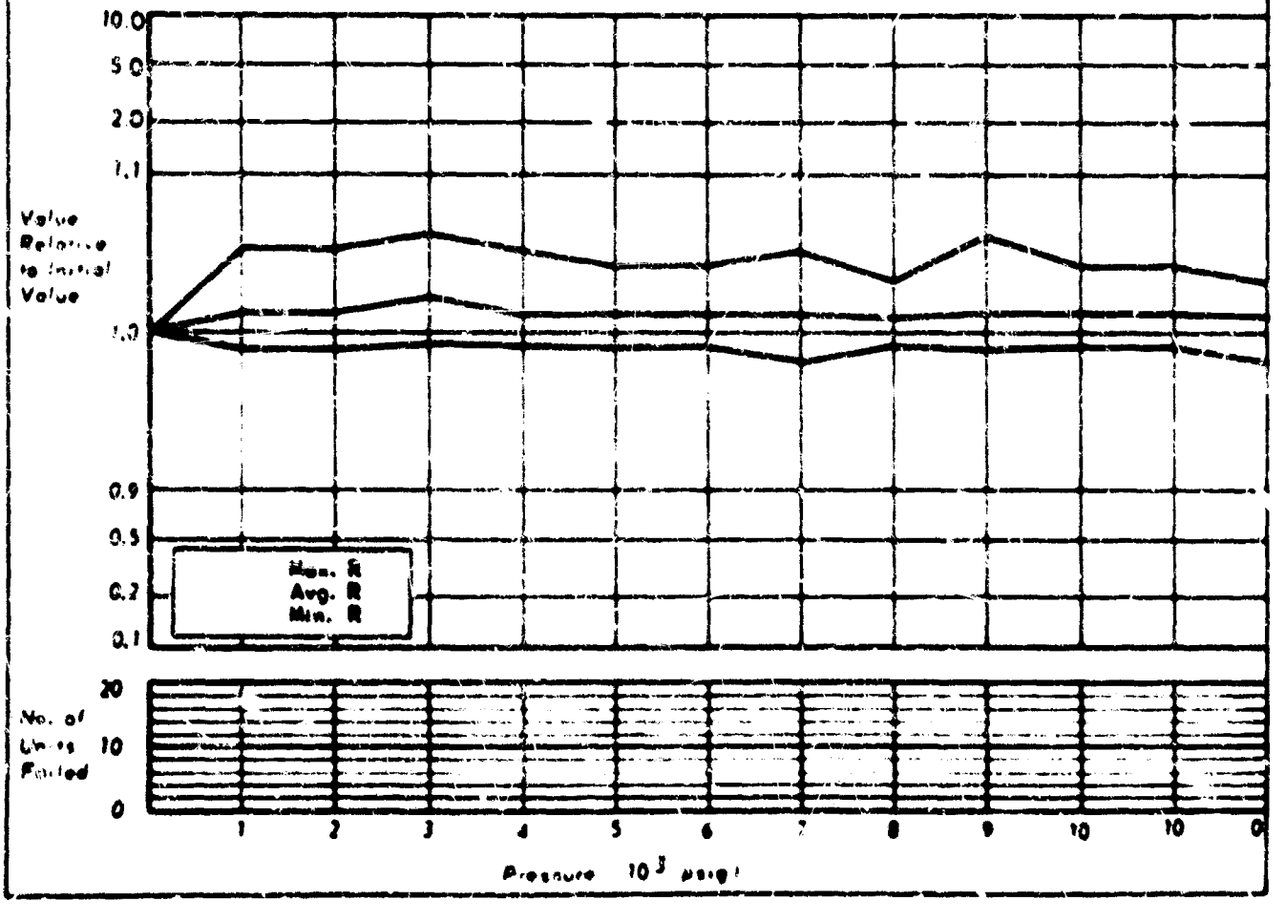
MFG. - GRMITE
TYPE - RESISTOR
DESCRIPTION - 999-98

CHART NO. 121
NO. OF SAMPLES TESTED - 20




MFG. - ONMITE
TYPE - RESISTOR
DESCRIPTION - 999 10A

CHART NO. 122
NO. OF SAMPLES TESTED - 19



| | | |
|---|---|---|
| Ohmite | 5 Ω ± 5% | Wire wound, vitreous mold |
| 995-5B | 5 W | Tubular, axial lead |
| Resistor | | 0.875 x 0.218" diam. |

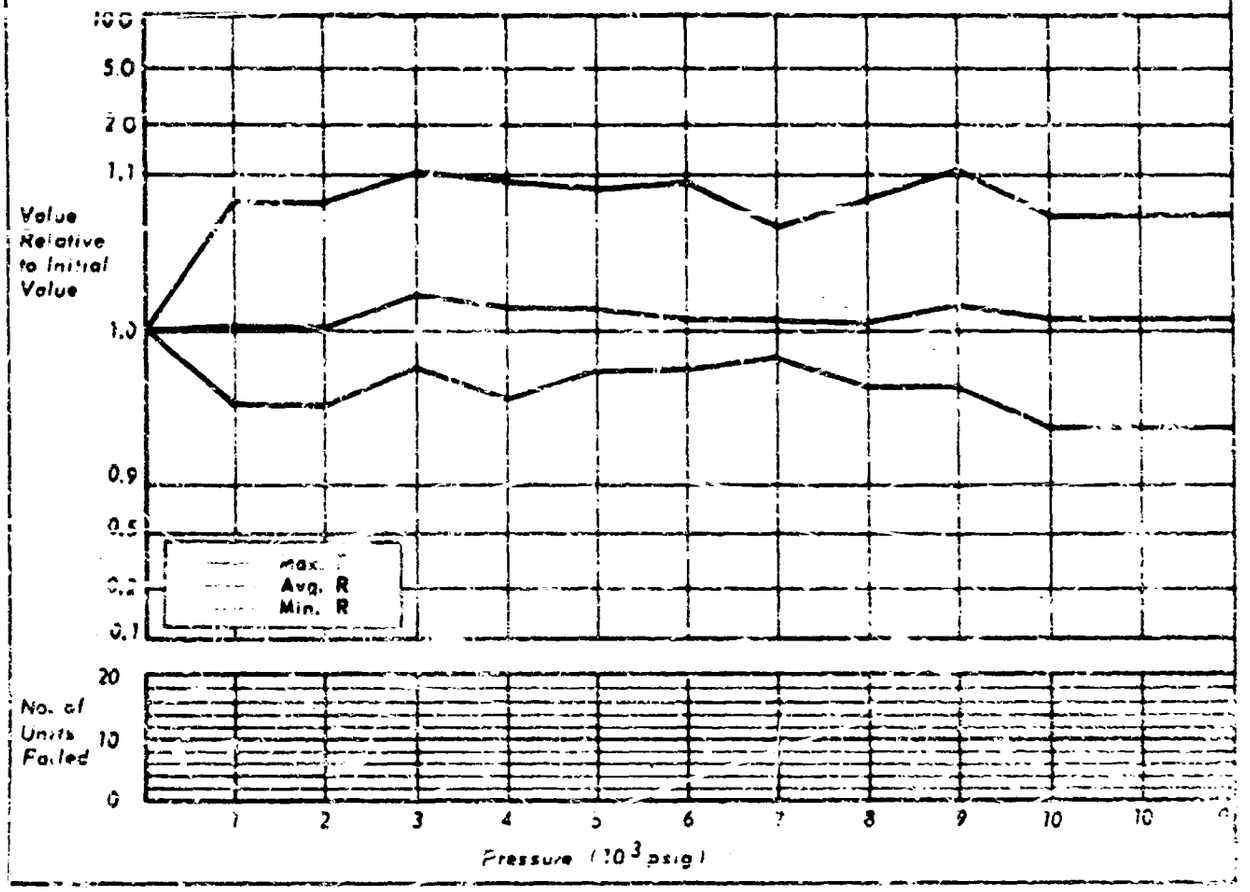
SOAK PERIOD: None
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Ohmite | 5 Ω ± 5% | Wire wound, vitreous mold |
| 995-10A | 10W | Tubular, axial lead |
| Resistor | | 1.25 x 0.312" diam. |

SOAK PERIOD: None
MECHANICAL: No apparent damage.
ELECTRICAL: All components indicated less than 10% change.

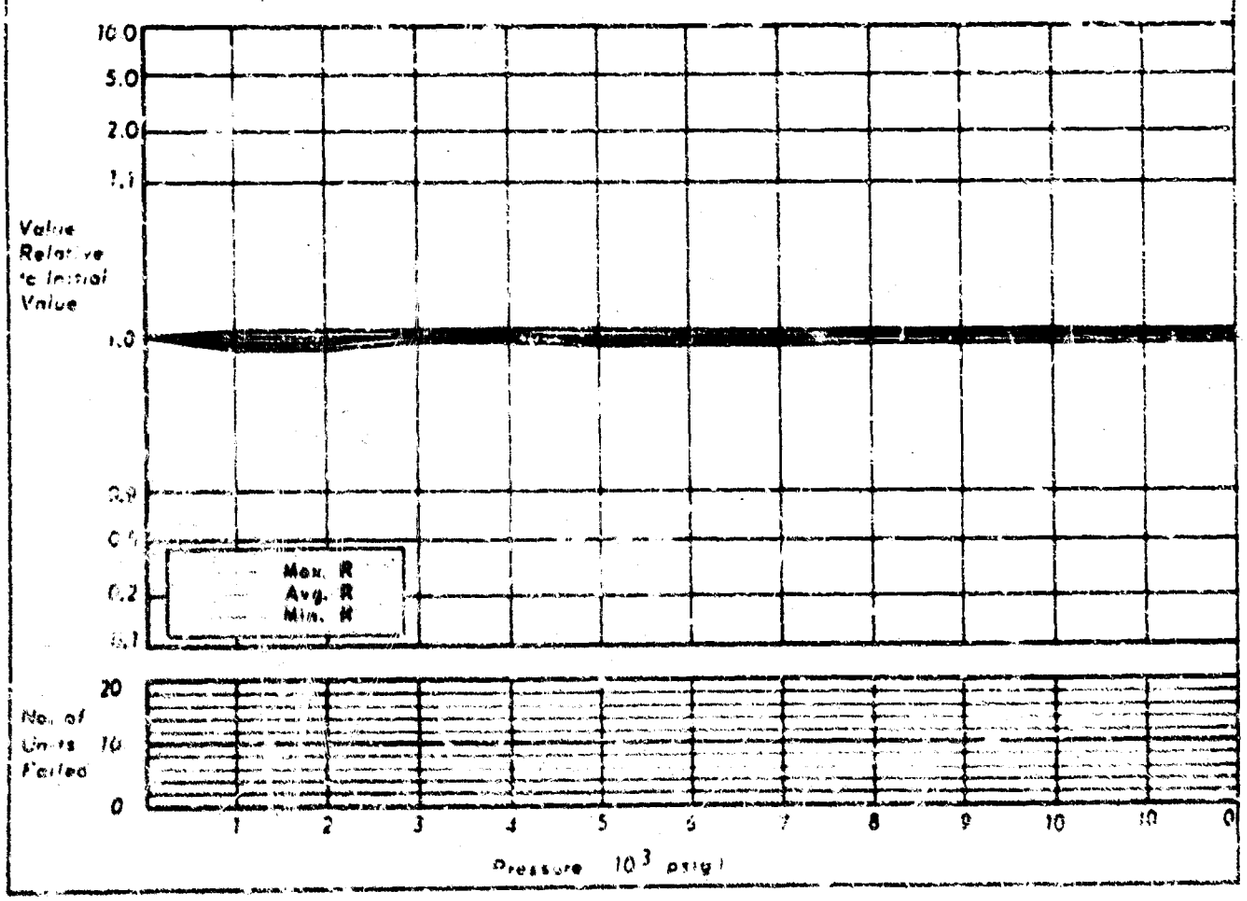
MFG. - OHMITE
TYPE - RESISTOR
DESCRIPTION - 695-1A 5Ω

CHART NO. 123
NO. OF SAMPLES TESTED - 20




MFG. - OHMITE
TYPE - RESISTOR
DESCRIPTION - 695-1A 5000Ω

CHART NO. 124
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Ohmite | 5 Ω ± 5% | Wire wound, vitreous mold |
| 995-1A | 1.5 W | Tubular, axial lead |
| Resistor | | 0.406 x 0.125" diam. |

SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Ohmite | 3.0 KΩ ± 5% | Wire wound, vitreous mold |
| 995-1A | 1.5 W | Tubular, axial lead |
| Resistor | | 0.406 x 0.125" diam. |

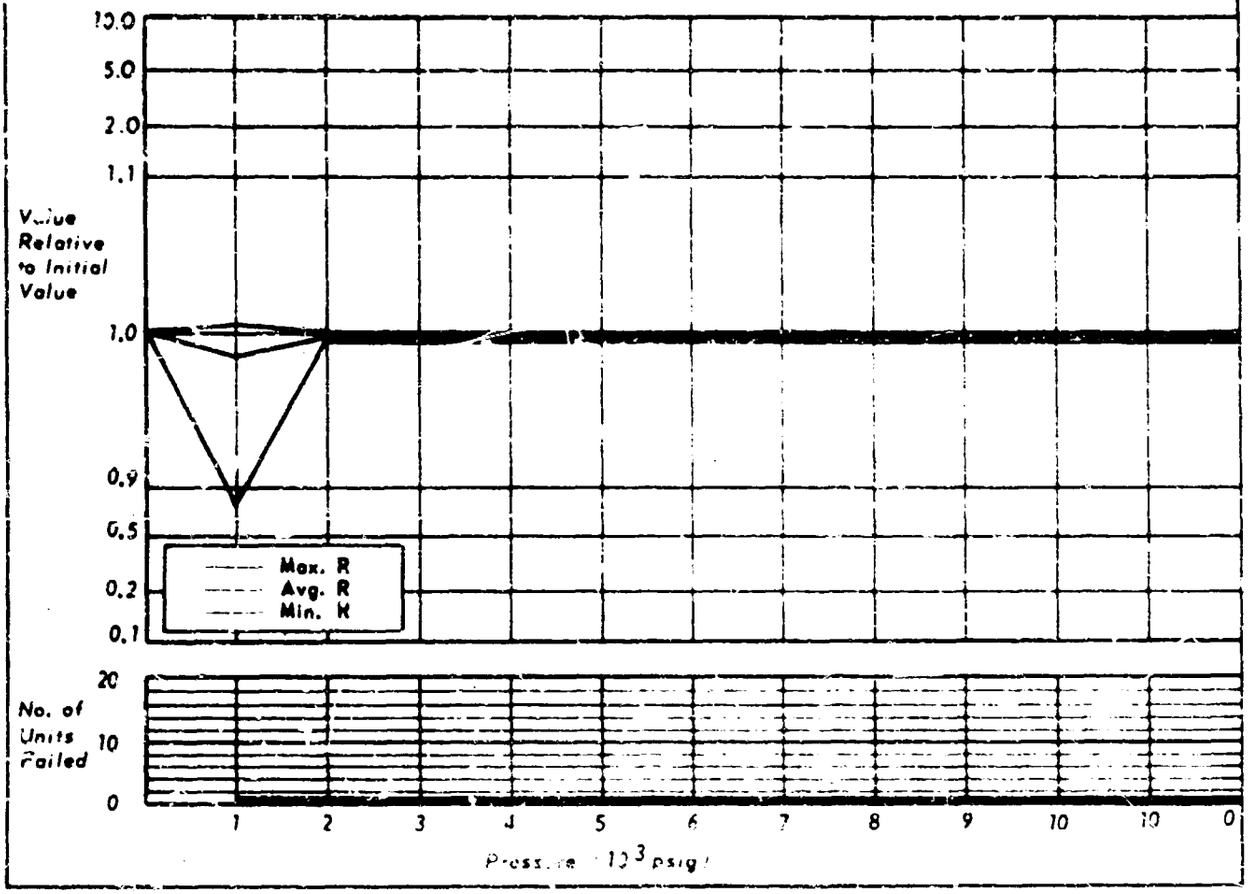
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

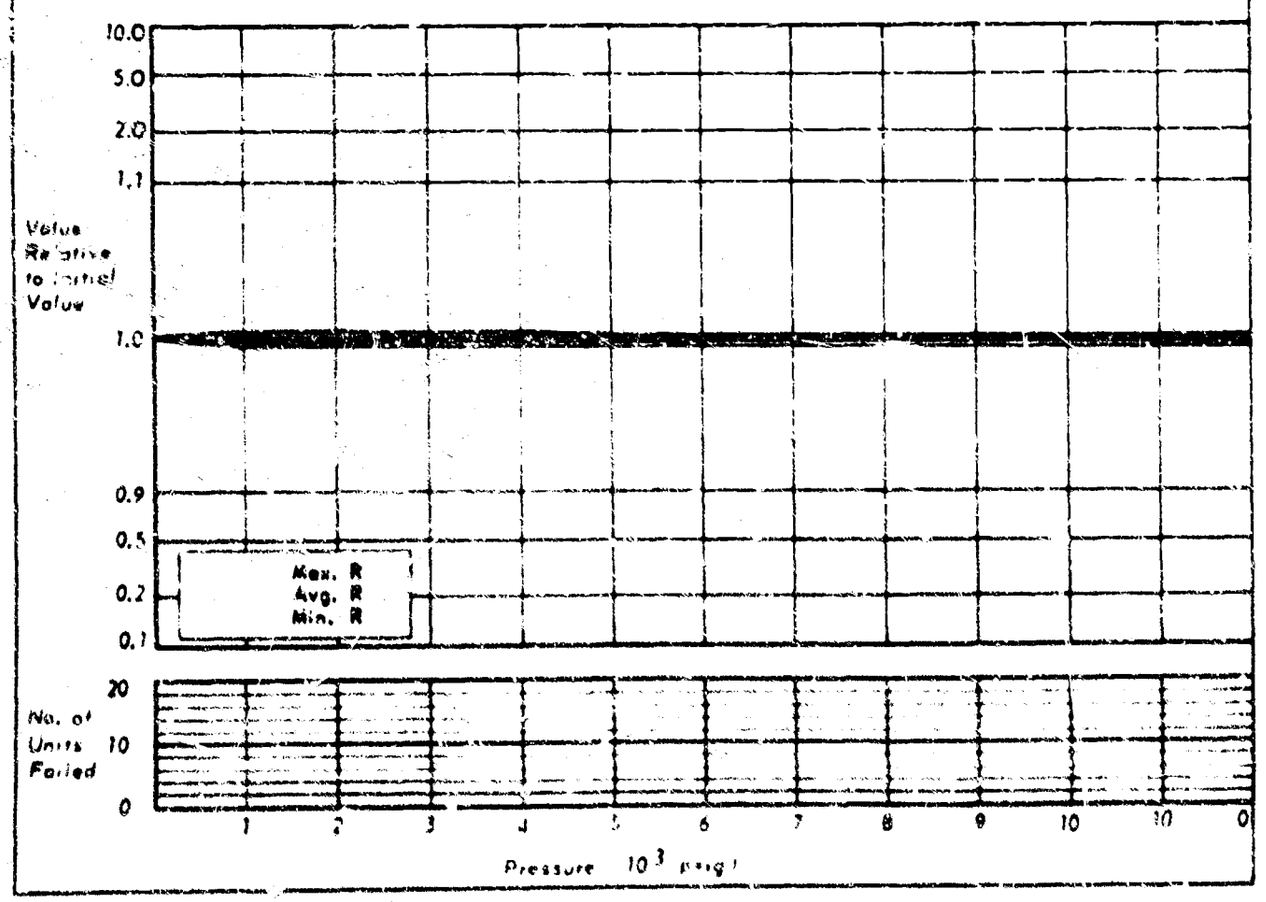
MFG.-OHMITE
TYPE - RESISTOR
DESCRIPTION - 995-5B

CHART NO. 125
NO. OF SAMPLES TESTED - 20




MFG.-OHMITE
TYPE - RESISTOR
DESCRIPTION - 995-10A

CHART NO. 126
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| Ohmite | 20.0 KΩ ± 5% | Wire wound, vitreous |
| 995-5B | 5W | Tubular, axial lead |
| Resistor | | 0.375 x 0.218" diam |

SOAK PERIOD: 16 hours at 10,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Ohmite | 20.0 KΩ ± 5% | Wire wound, vitreous |
| 995-10A | 10W | Tubular, axial lead |
| Resistor | | 1.25 x 0.312" diam. |

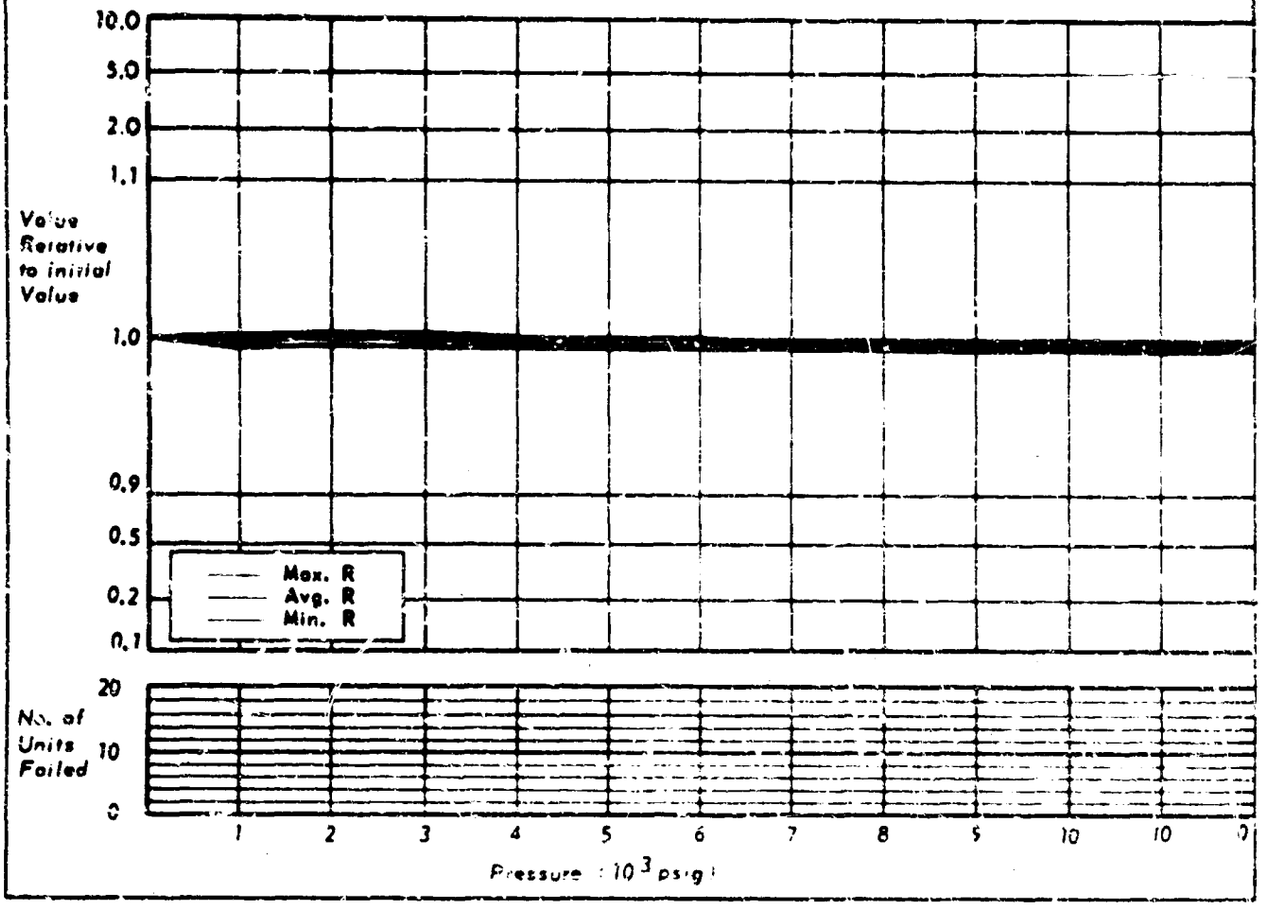
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

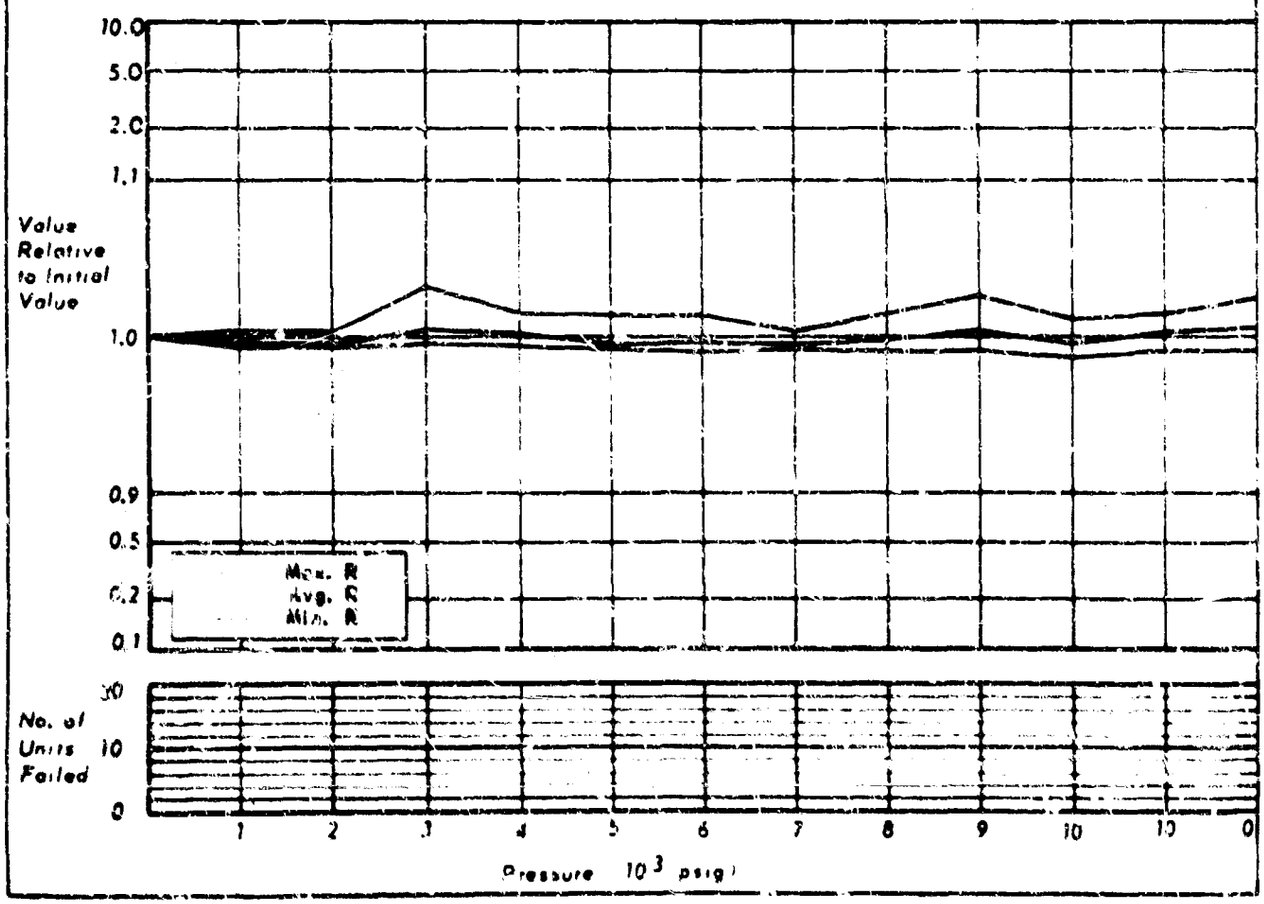
MFG.- TEXAS INSTRUMENT
TYPE - RESISTOR
DESCRIPTION - RM80

CHART NO. 127
NO. OF SAMPLES TESTED - 20




MFG.- TEXAS INSTRUMENT
TYPE - RESISTOR
DESCRIPTION - CR 1/4 10I

CHART NO. 128
NO. OF SAMPLES TESTED - 10



| | | |
|---|---|---|
| Texas Instruments | 100 & 100 K Ω ± 1% | Metal film, molded |
| MM60 | 0.125 W | Tubular, axial lead |
| Resistor | | 0.4 x 0.135" diam |

NOTE: Ten components of each of the two resistance values shown were submitted and tested as a set of twenty.

SOAK PERIOD: 15.5 hours at 10,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Texas Instruments | 110 Ω | Carbon film, epoxy encap |
| CR ¼ | 0.25 W | Tubular, axial lead |
| Resistor | | 0.375 x 0.105" diam. |

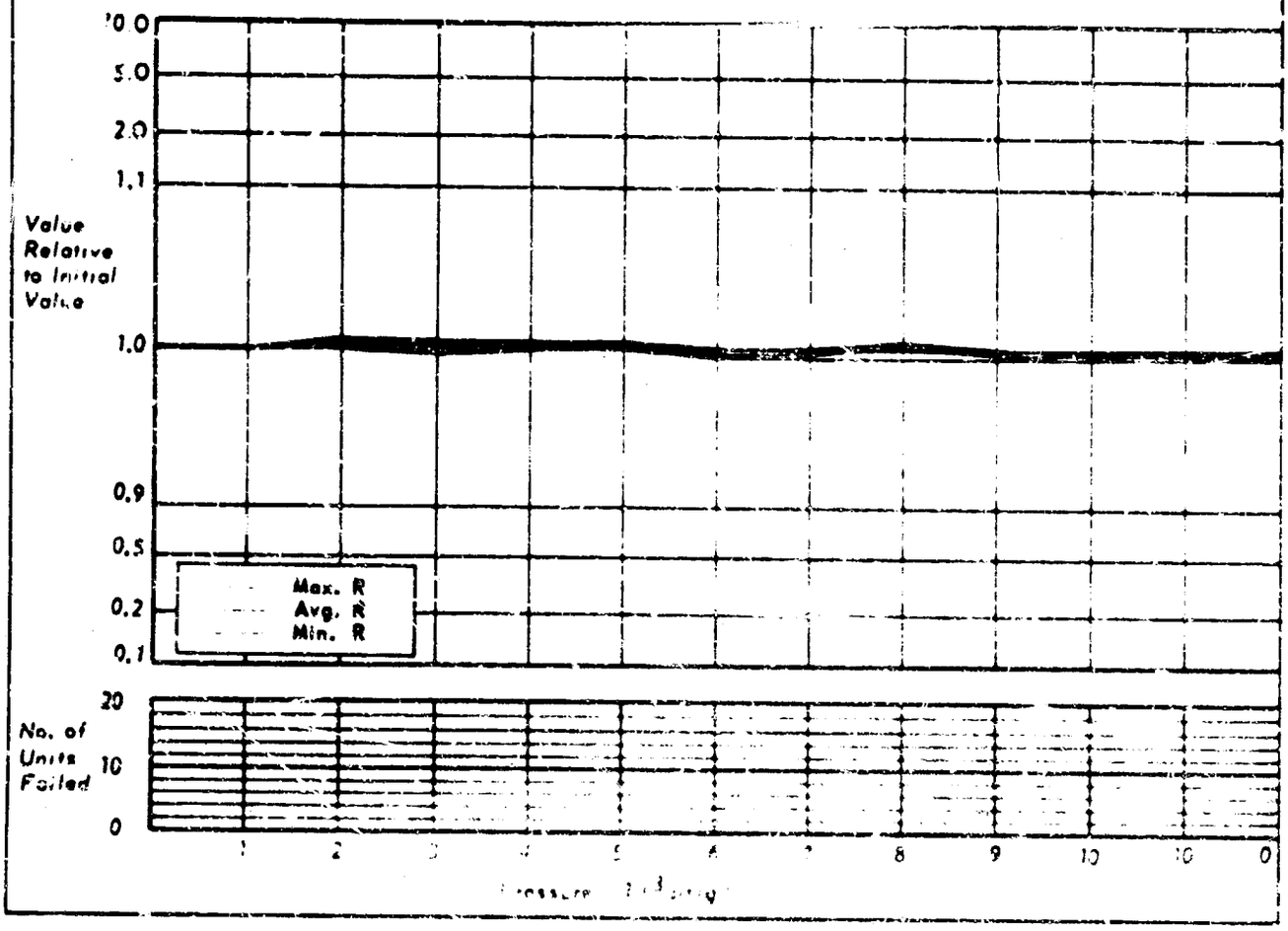
SOAK PERIOD: 15.5 hours at 10,00 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

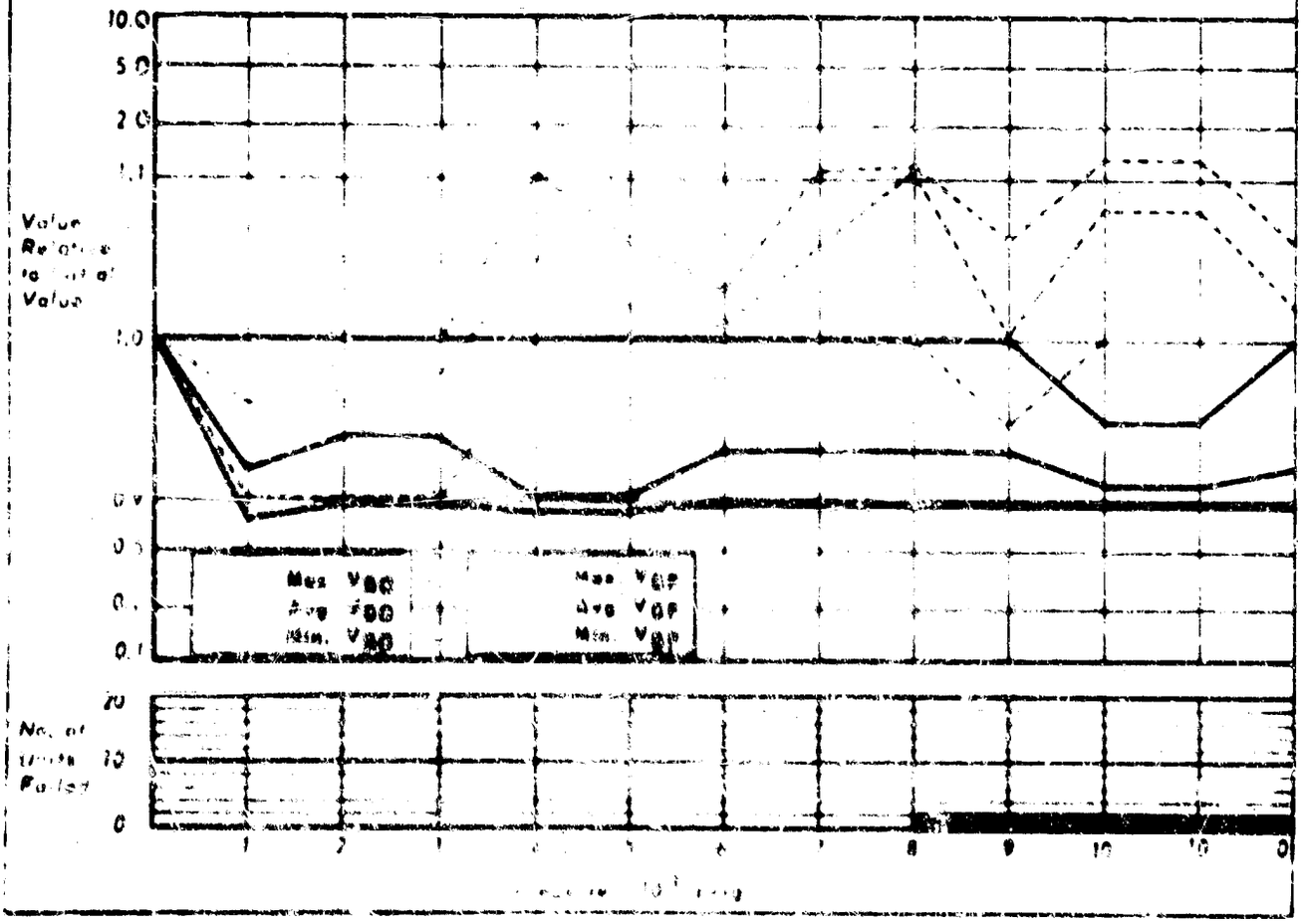
MFG. - TEXAS INSTRUMENT
TYPE - RESISTOR
DESCRIPTION - CR 1/4

CHART NO. 129
NO. OF SAMPLES TESTED - 10




MFG. - MOTOROLA
TYPE - SILICON CONTROLLED RECTIFIER
DESCRIPTION - 2N682

CHART NO. 130
NO. OF SAMPLES - 5



| | | |
|---|---|---|
| Texas Instruments | 100 kΩ | Carbon film, epoxy encap |
| CR ¼ | 0.25 W | Tubular, axial lead |
| Resistor | | 0.275 x 0.105" diam. |

SOAK PERIOD: 15.5 hours at 10,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

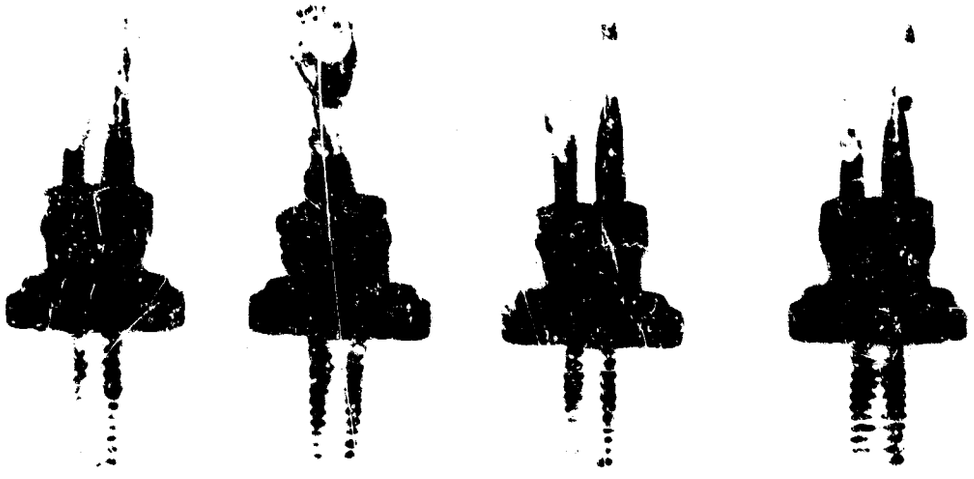
| | | |
|---|---|---|
| Motorola | 5K PRV | Silicon, diffused junction |
| 2N682 | 25 A rms | Welded cap, stud mount |
| Silicon controlled rectifier | | 0.93 x 0.56" diam. |

SOAK PERIOD: None

MECHANICAL: Visual inspection after completion of testing showed deformed cases on three components.

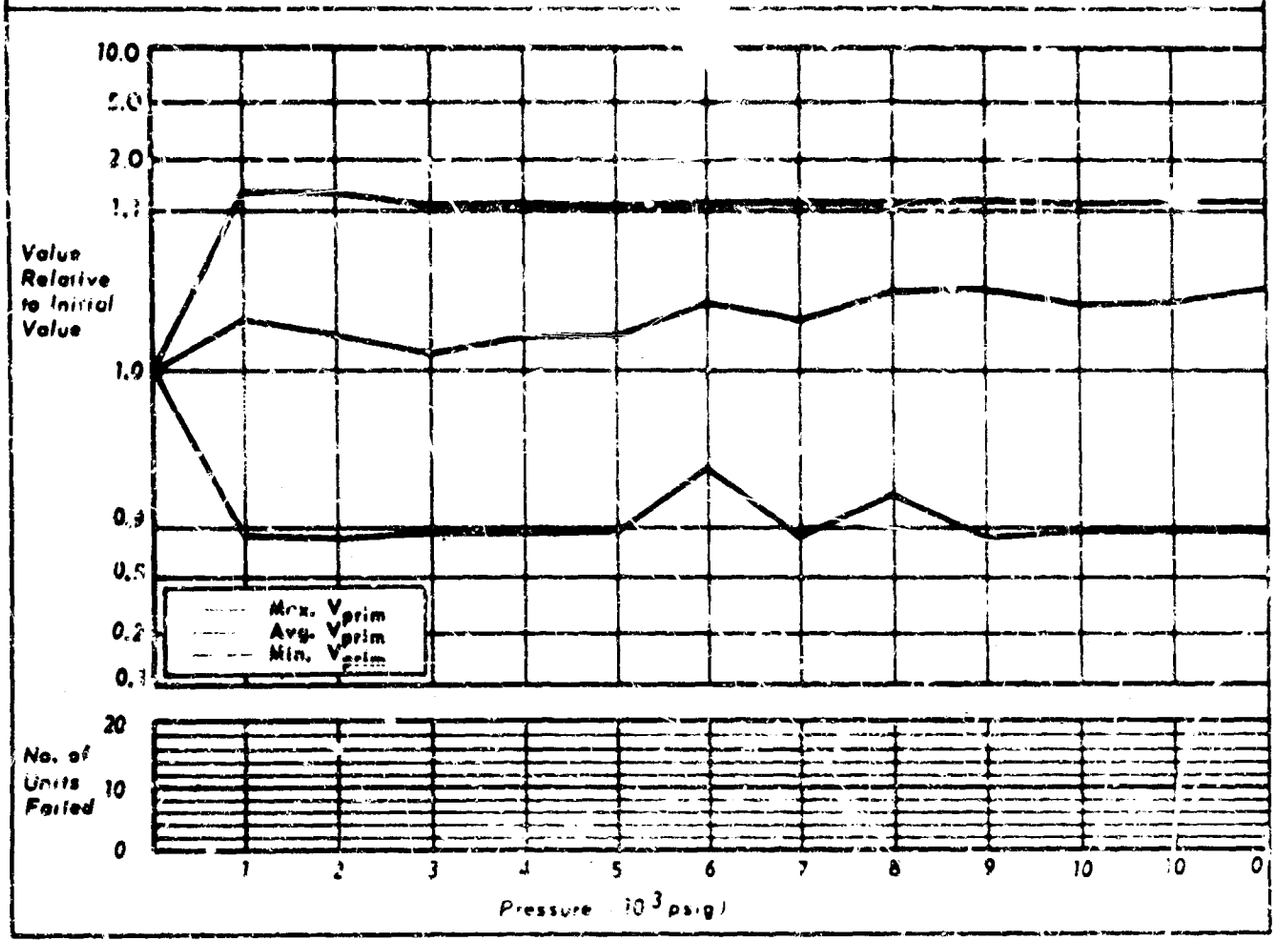
ELECTRICAL: Two components indicated less than 10% change. One component indicated greater than 10% and less than 25% change.

FAILURES: Two components failed above 6,000 psig.



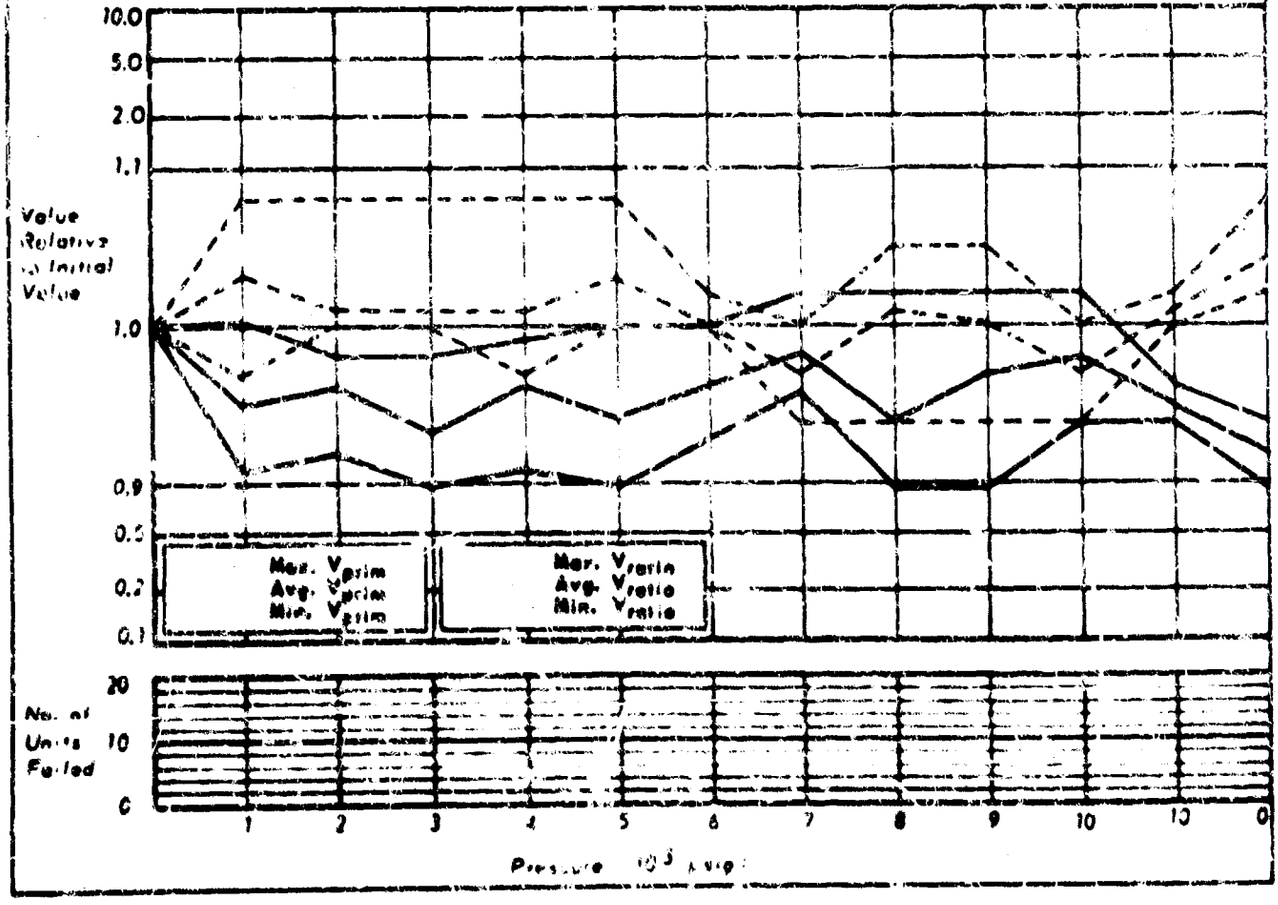
MFG. - GENERAL INSTRUMENTS
TYPE - TRANSFORMER
DESCRIPTION - C-5240758

CHART NO. 131
NO. OF SAMPLES TESTED - 30




MFG. - MICROTRAN
TYPE - TRANSFORMER
DESCRIPTION - [illegible]

CHART NO. 132
NO. OF SAMPLES TESTED - 3



| | | |
|---|---|---|
| General Instruments | Pri. induct. 500 μH | Adj. tuning core |
| F. W. Sickles Div. | Sec. induct. 500 μH | Ceramic form |
| C5249736 | at 20 Mc | |
| R. F. Transformer | | |

SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: Ten components indicated less than 10% change.
Ten components indicated a change greater than 10% and less than 50%.

| | | |
|---|---|---|
| Microtran | Pri. Imp. 10,000 | Cast epoxy |
| MM3-M | Sec. Imp. 200 | Plug in type |
| Transformer | Freq. resp. 150–10,000 | 0.875 x 0.781 x 0.531" |

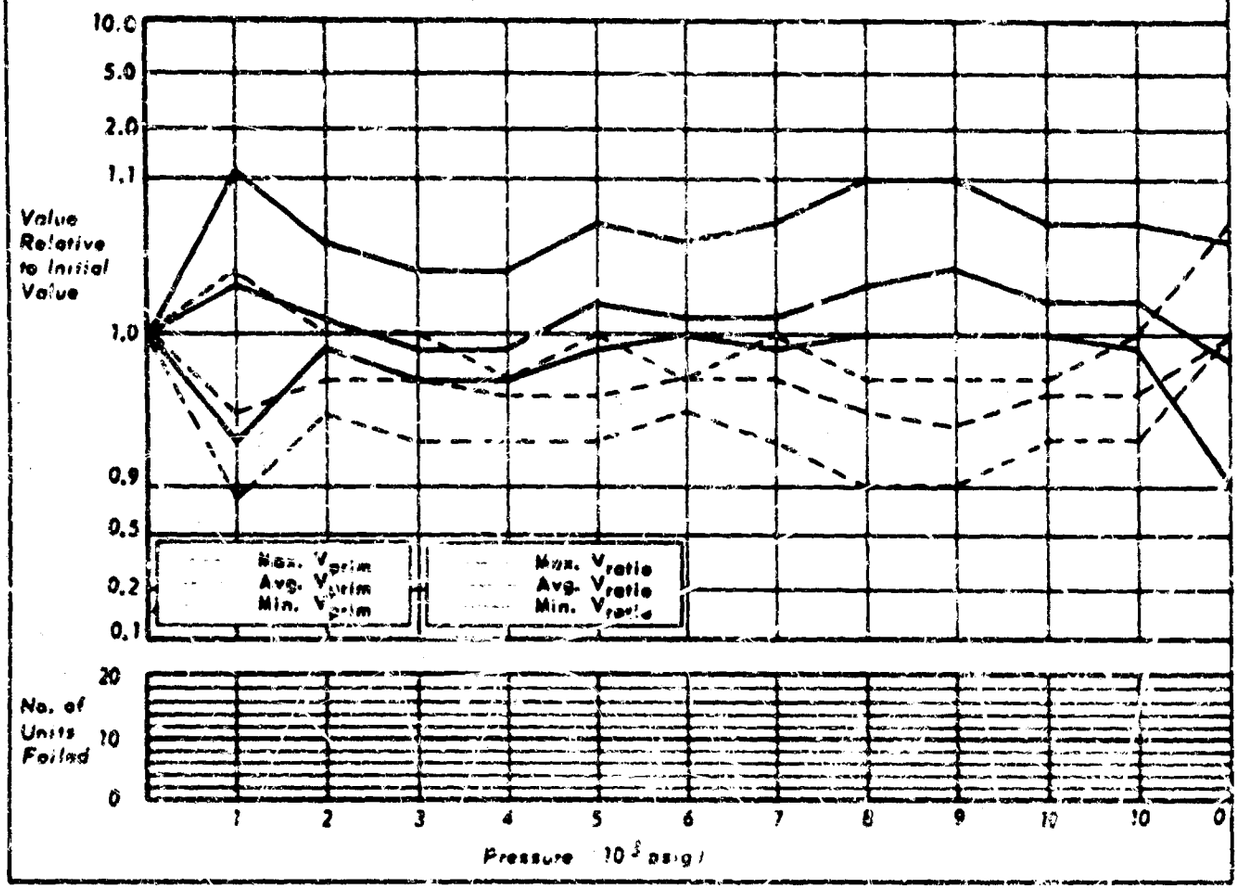
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: Four components indicated a change greater than 10% and less than 50%.
One component indicated a change greater than 50% with subsequent recovery to less than 50% at the pressures shown on failure graph on opposite page.

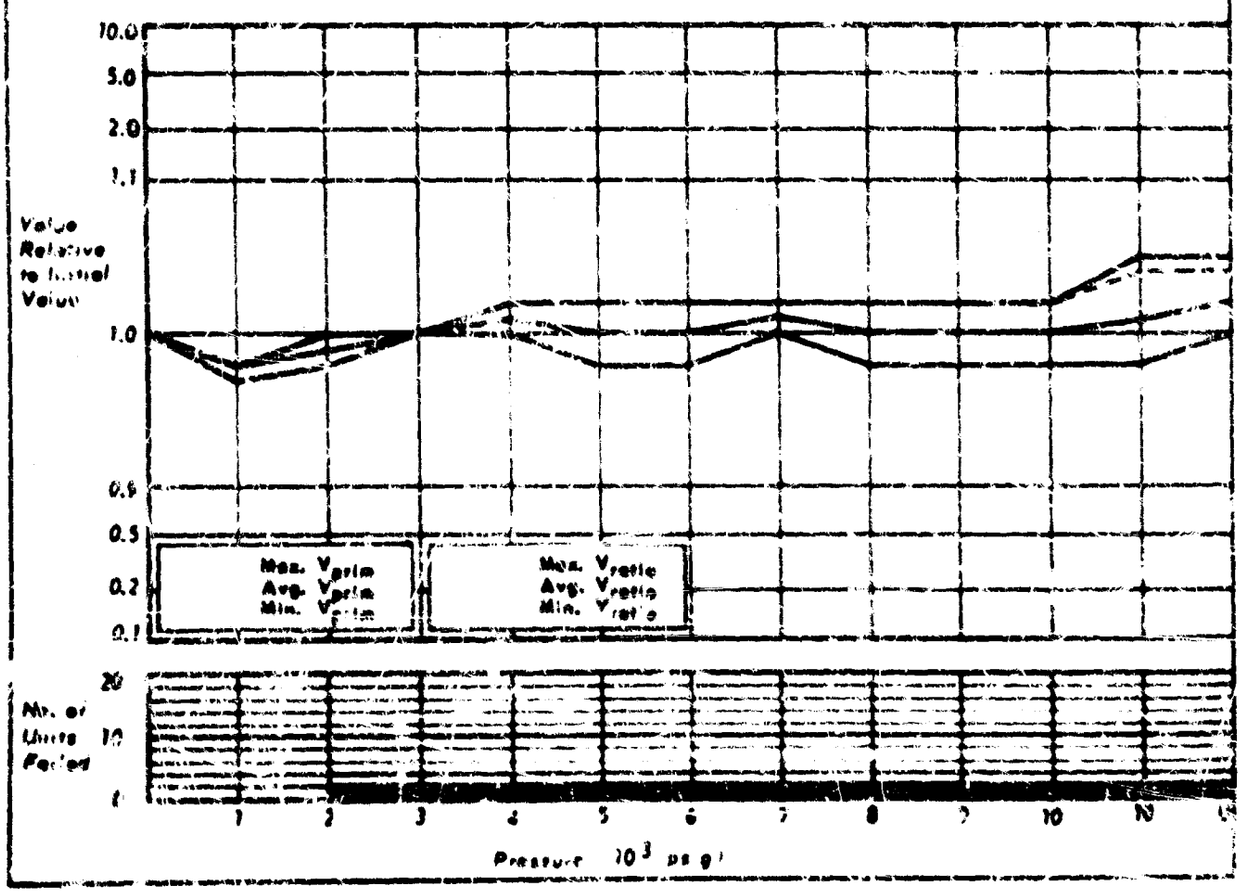
MFG. - MICROTRAN
TYPE - TRANSFORMER
DESCRIPTION - MM7-P8

CHART NO. 133
NO. OF SAMPLES TESTED - 5




MFG. - MICROTRAN
TYPE - TRANSFORMER
DESCRIPTION - VM16M

CHART NO. 134
NO. OF SAMPLES TESTED - 8



| | | |
|---|---|---|
| Microtron | Pri. Imp. 30,000 | Open frame |
| MM7-FB | Sec. Imp. 1,200 | Bracket mount |
| Transformer, output | Freq resp 200–10,000 | 0.5 x 0.562 x 0.437" |

SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Microtron | Pri. Imp. 500 | Epoxy potted |
| VM 16-M | Sec. Imp. 250 | Plug-in type |
| Transformer, driver | 16W level 15 | 0.5 x 0.562 x 0.437" |

SOAK PERIOD: None

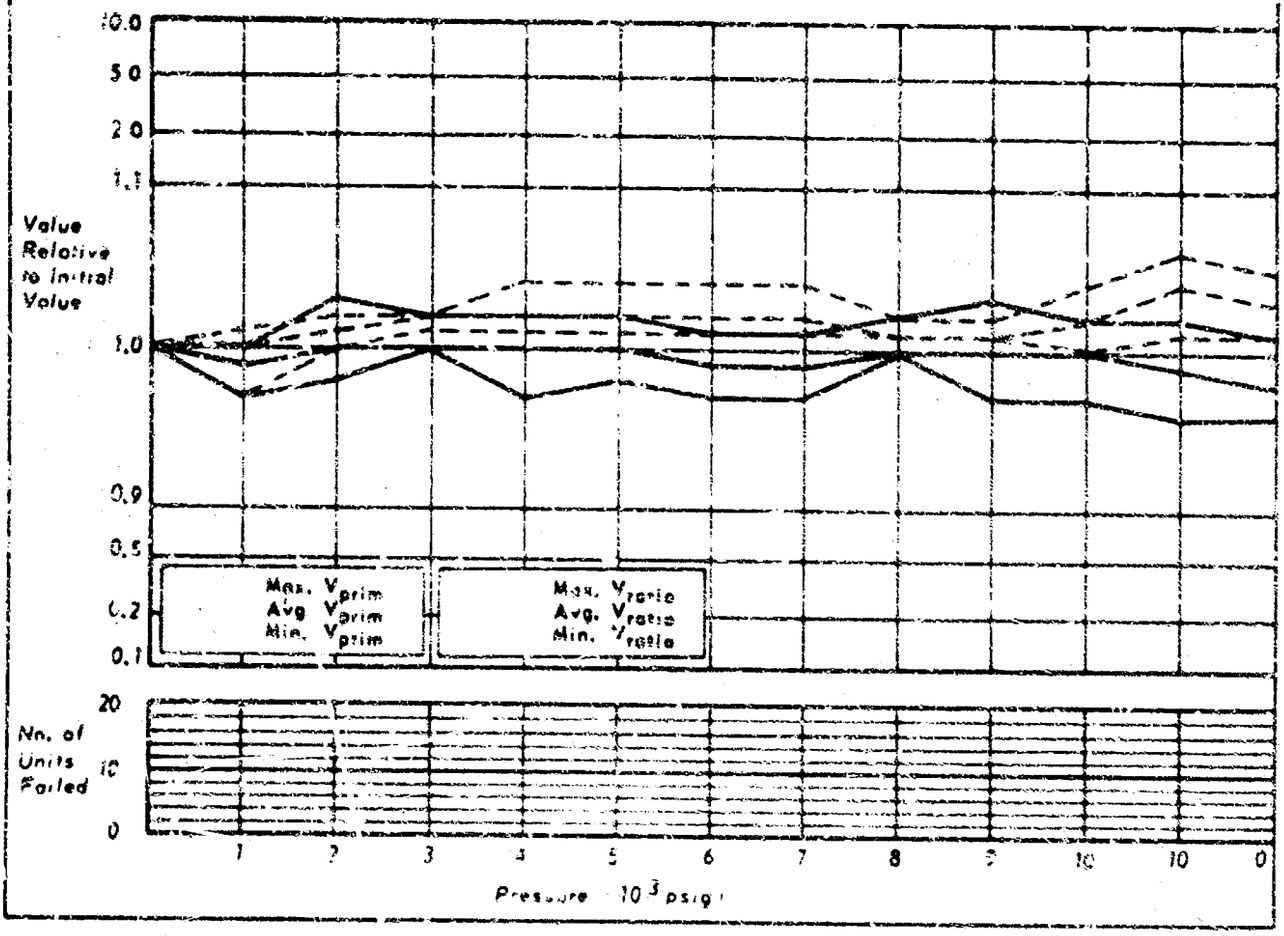
MECHANICAL: No apparent damage.

ELECTRICAL: One component indicated a greater than 30% change with subsequent recovery at pressures shown on graph on opposite page.

FAILURES: Four components indicated a permanent change greater than 30%.

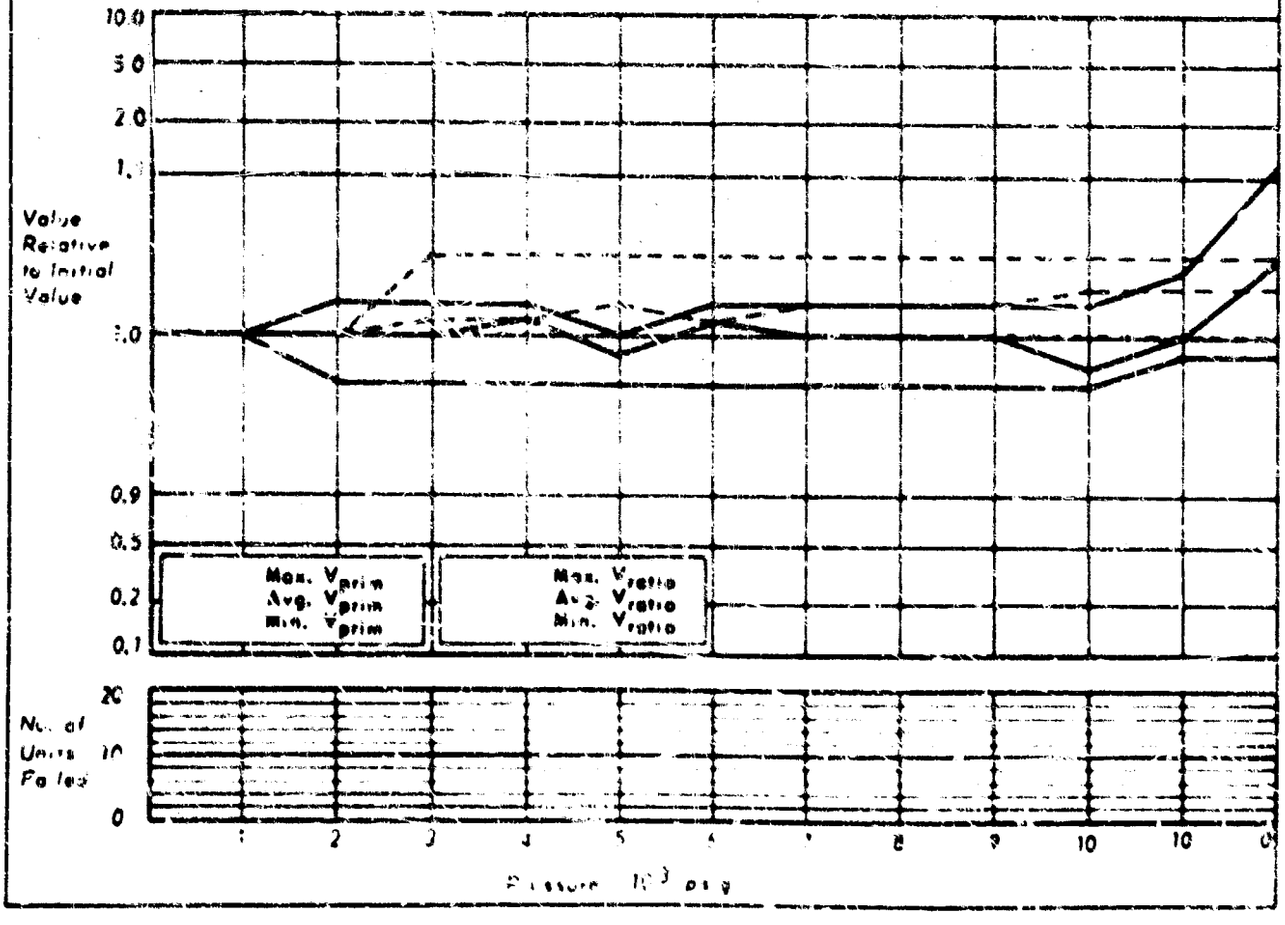
MFG.-MICROTRAN
TYPE-TRANSFORMER
DESCRIPTION-UM3-A

CHART NO. 135
NO. OF SAMPLES TESTED-8




MFG.-MICROTRAN
TYPE-TRANSFORMER
DESCRIPTION-VM6-FP3

CHART NO. 136
NO. OF SAMPLES TESTED-8



| | | |
|---|---|---|
| Microtran | Pri. Imp. 10,000 | Open frame |
| VM 31-F | Sec. Imp. 1,200 | Bracket mount |
| Transformer, interstage | MW level 5 | 0.513 x 0.469 x 0.437" |

SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| Microtran | Pri. Imp. 100,000 | Open frame |
| VM 6 FPB | Sec. Imp. 1,200 | Bracket mount |
| Transformer | MW level 5 | 0.513 x 0.469 x 0.437" |

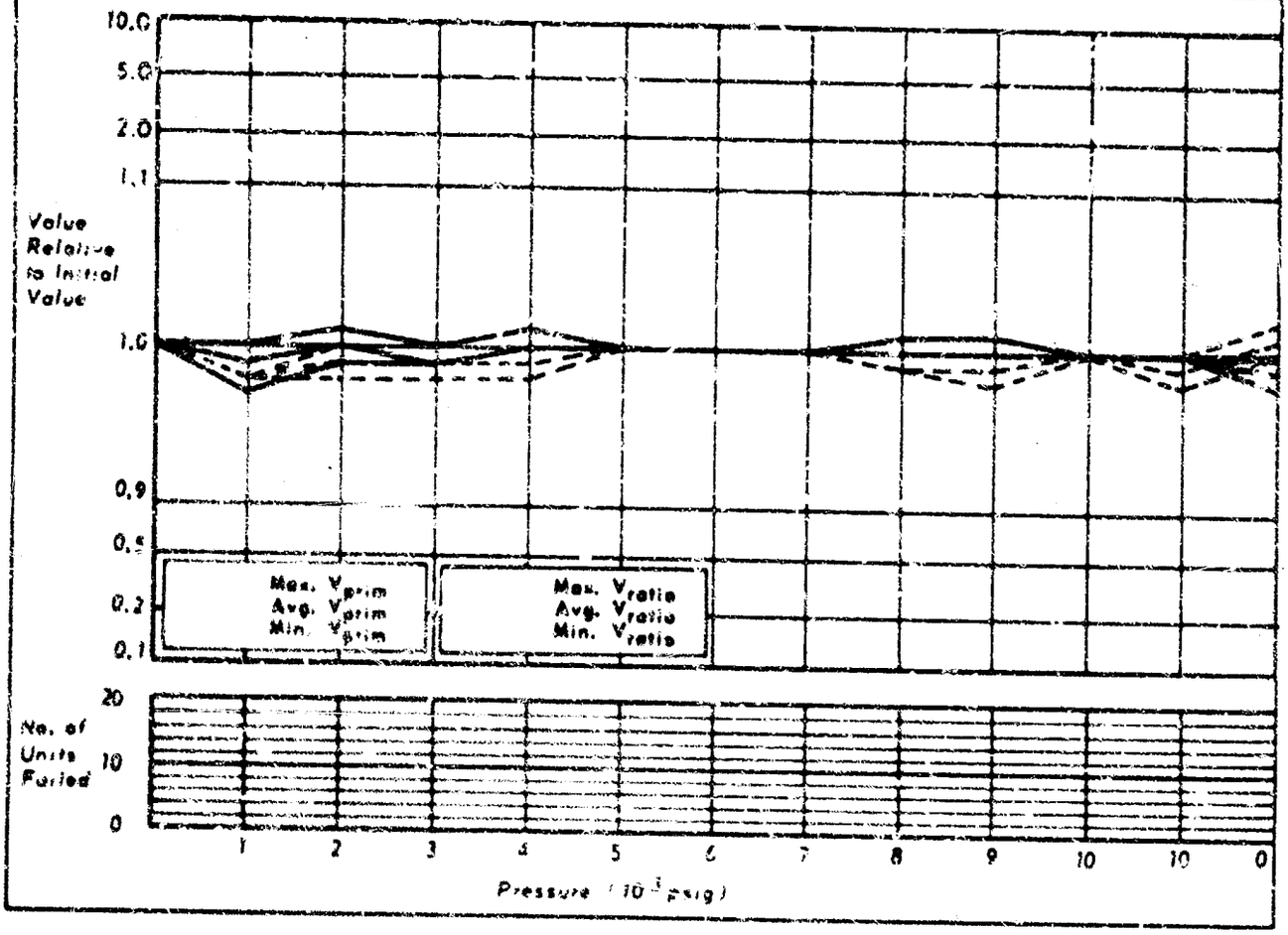
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

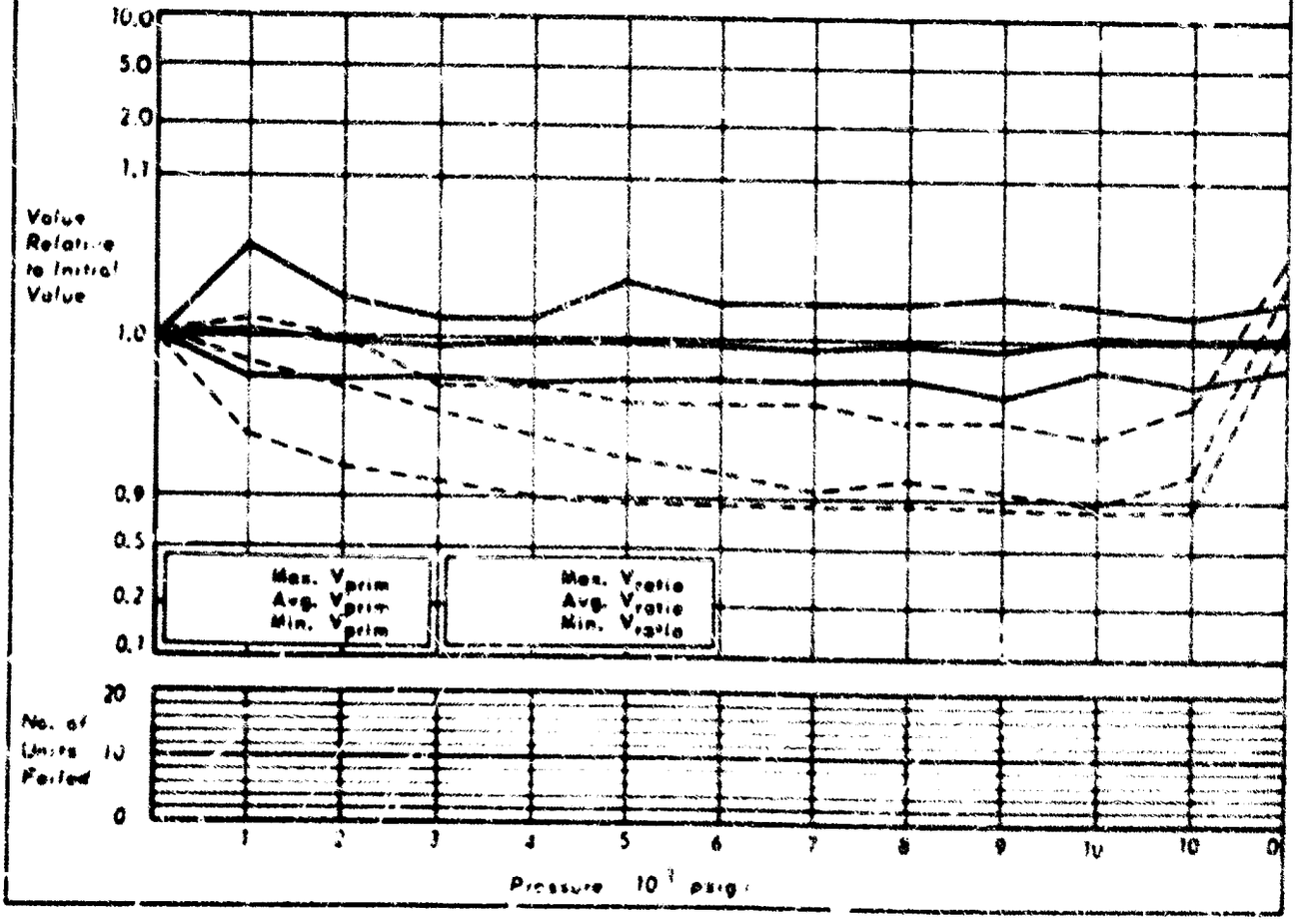
MFG.-MICROTRAN
TYPE-TRANSFORMER
DESCRIPTION-FC85-F

CHART NO. 137
NO. OF SAMPLES TESTED-10




MFG.-UNITED TRANSFORMER
TYPE-TRANSFORMER
DESCRIPTION-SN 727

CHART NO. 138
NO. OF SAMPLES TESTED-20



| | | |
|---|---|---|
| Microtran | Pri. Imp. 1,500 Ω | Open frame |
| PM33-F | Sec. Imp. 600 Ω | Bracket mount |
| Transformer, output | MW level 50 | 0.375 x 0.344 x 0.24" |

**SOAK PERIOD:** None

**MECHANICAL:** No apparent damage.

**ELECTRICAL:** All components indicated a change greater than 10% and less than 50%.

| | | |
|---|---|---|
| United Transformer | Pri. Imp. 500 | Epoxy impreg |
| GH-727 | Sec. Imp. 50 | Free flooding |
| Transformer | MW level 30 | 0.68 x 0.5 x 0.966" |

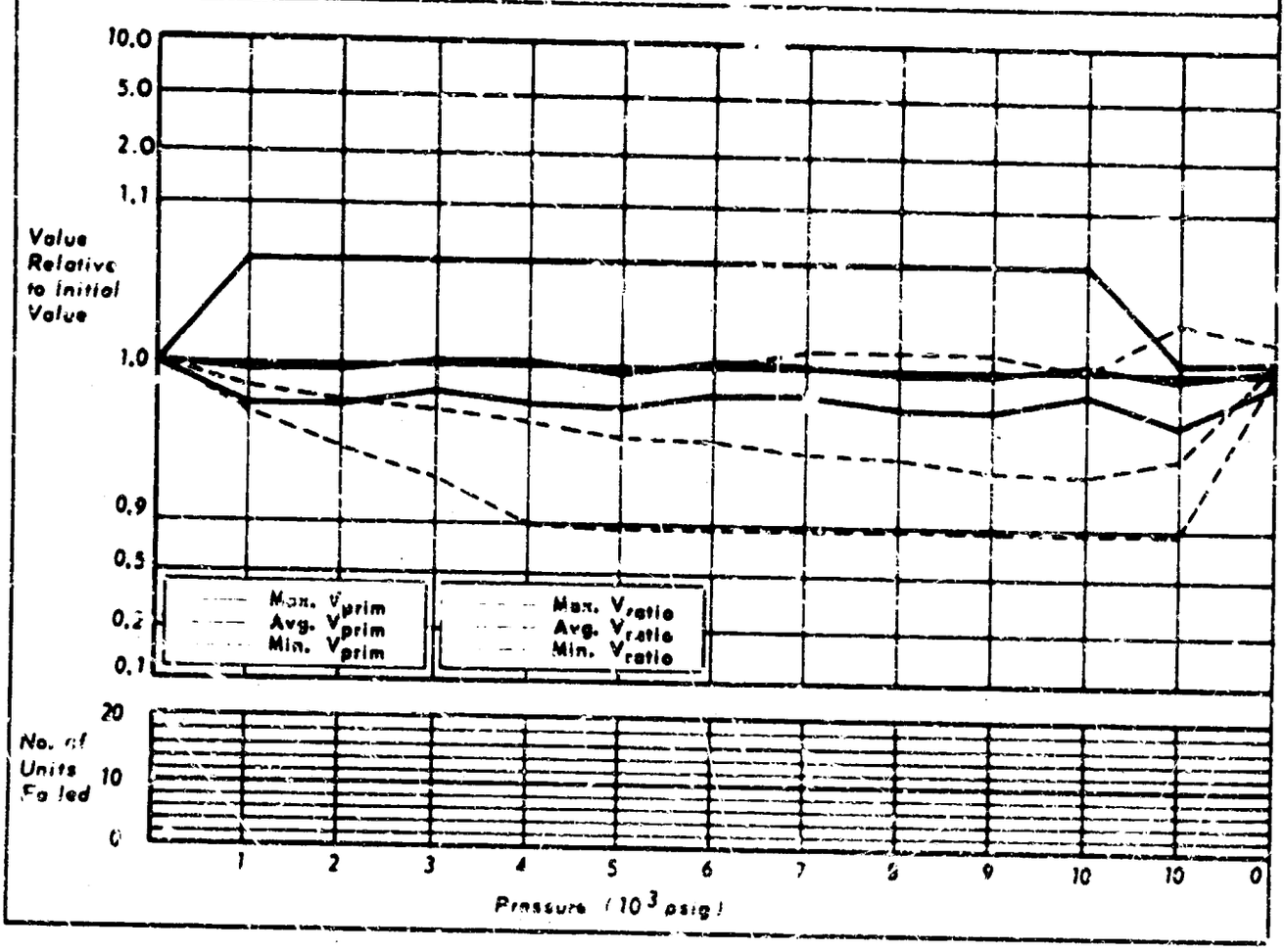
**SOAK PERIOD:** None

**MECHANICAL:** No apparent damage.

**ELECTRICAL:** Fourteen components indicated less than 10% change. Five components indicated more than 10% and less than 50% change.

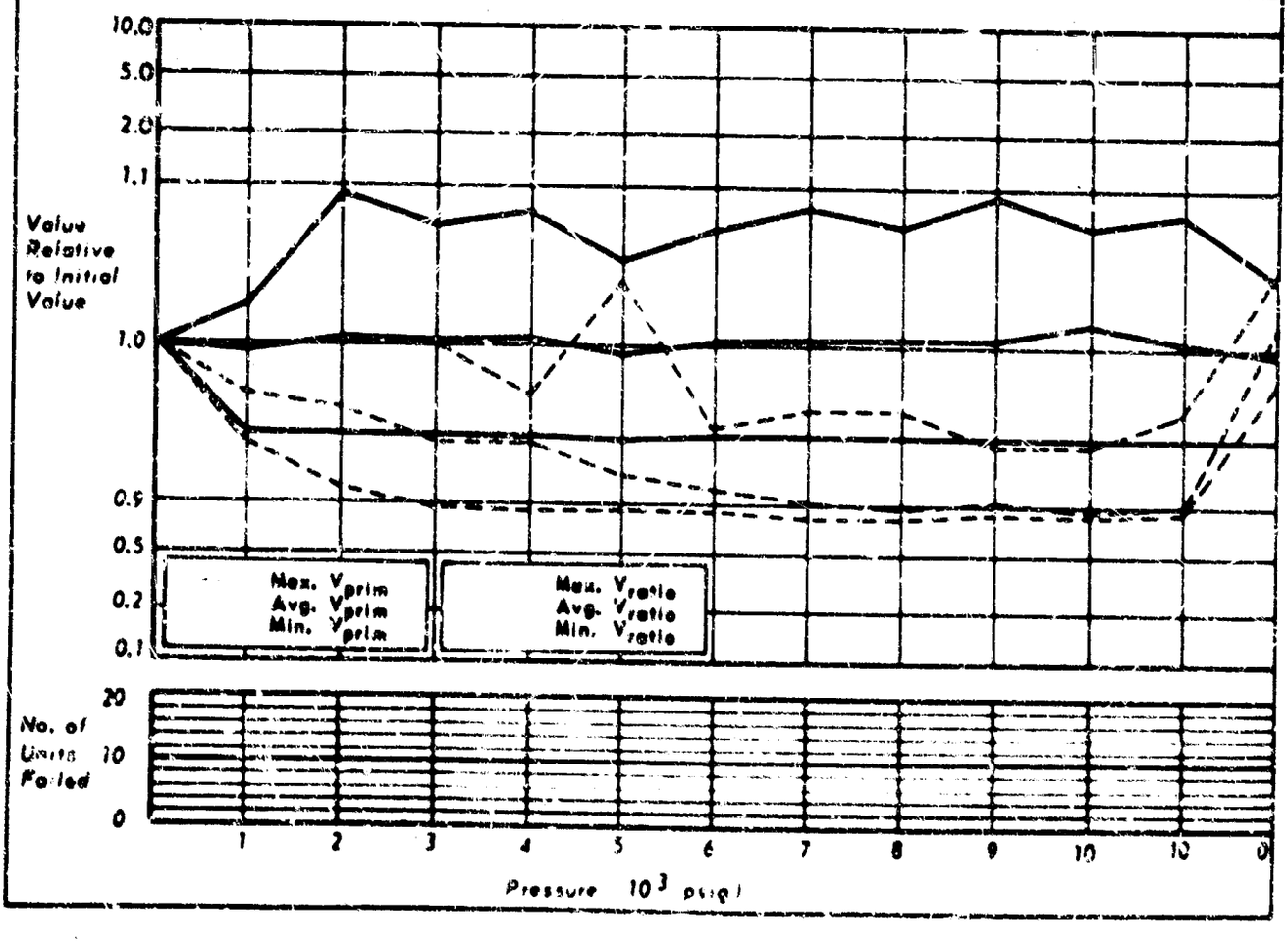
MFG.-UNITED TRANSFORMER
TYPE-TRANSFORMER
DESCRIPTION-63-729

CHART NO. 139
NO. OF SAMPLES TESTED-20




MFG.-UNITED TRANSFORMER
TYPE-TRANSFORMER
DESCRIPTION-63-729

CHART NO. 140
NO. OF SAMPLES TESTED-20



| | | |
|---|---|---|
| United transformer | Pri. Imp. 500 Ω | Wax impreg. |
| GH-726 | Sec. Imp. 50 Ω | Free flooding, metal case |
| Transformer | MW level 30 | 0.[illegible] x 0.5 x 0.906" |

SOAK PERIOD: 64 hours at 10,000 psig.

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated less than 10% change.

| | | |
|---|---|---|
| United transformer | Pri. Imp. 500/125 Ω CT | Epoxy impreg. |
| GH-729 | Sec. Imp. 150/37.5 Ω CT | Free flooding, metal case |
| Transformer | MW level 1 W at 200 cps | 1.4 x 0.95 x 0.218" |

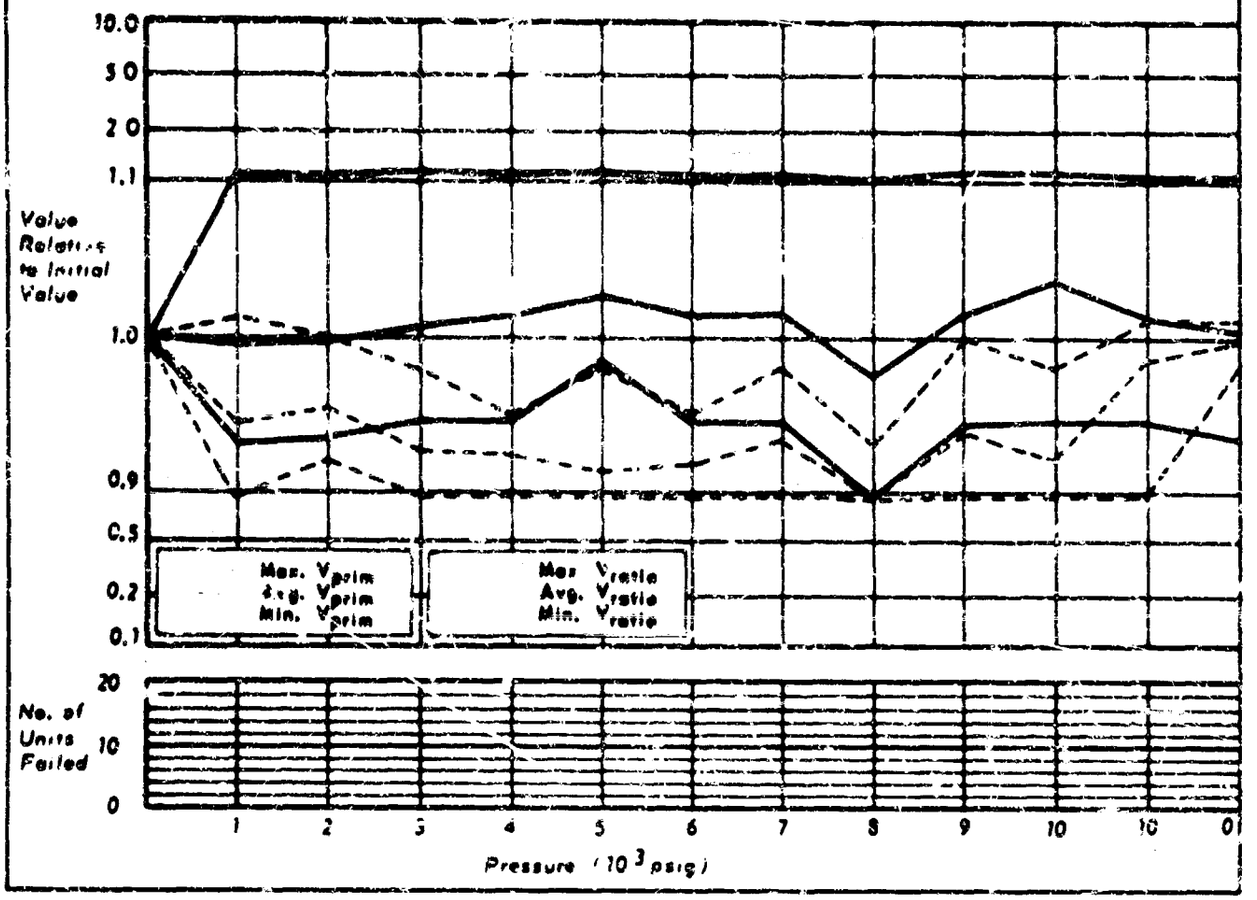
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: Sixteen components indicated less than 10% change.
Four components indicated a change greater than 10% and less than 50%.

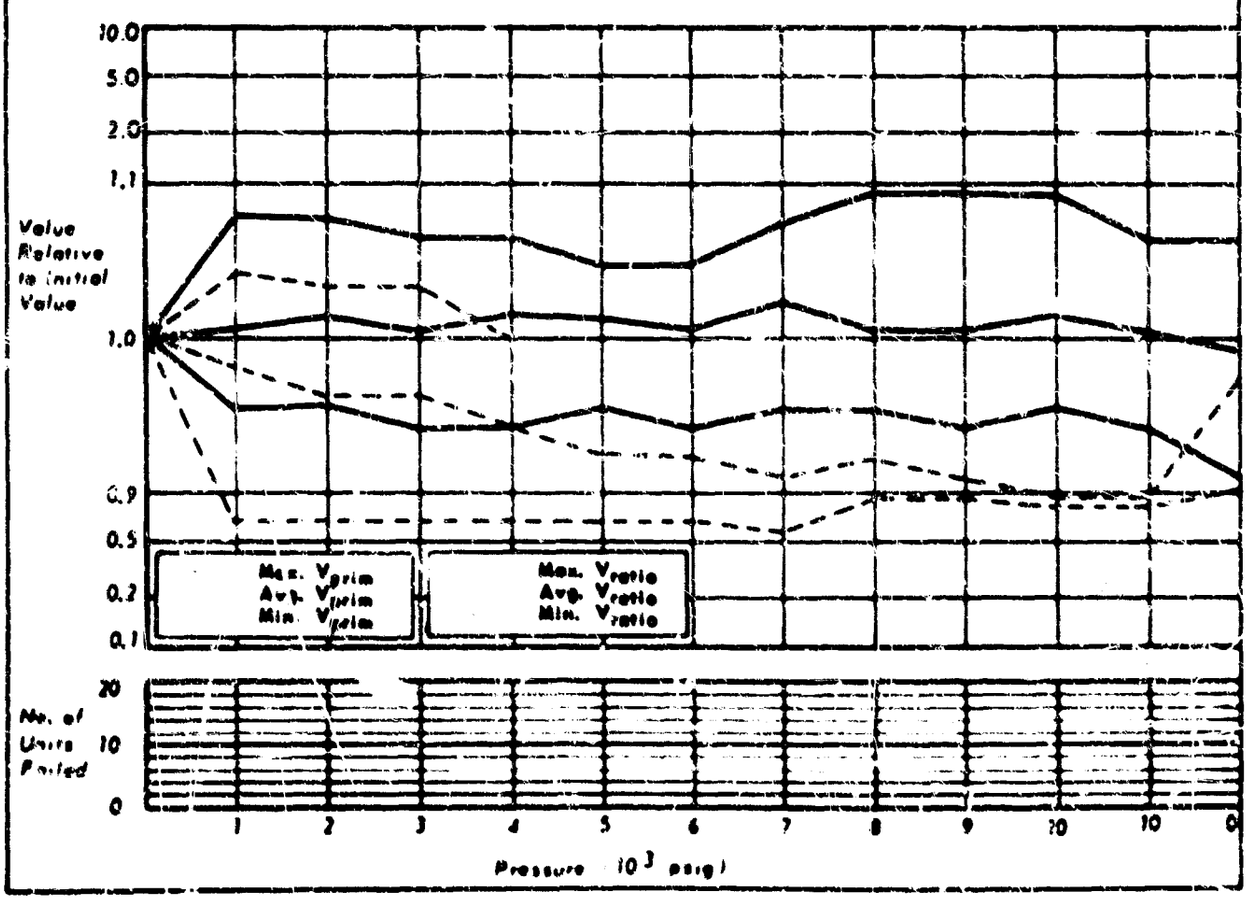
MFG. - UNITED TRANSFORMER
TYPE - TRANSFORMER
DESCRIPTION - 6H - 780

CHART NO. 141
NO. OF SAMPLES TESTED - 20




MFG. - UNITED TRANSFORMER
TYPE - TRANSFORMER
DESCRIPTION - 8G - T - 28

CHART NO. 142
NO. OF SAMPLES TESTED - 10



| | | |
|---|---|---|
| United transformer | 500/135 Ω CT | Varnish impreg. |
| GH-728 | 150/37.5 Ω CT | Free floating, metal case |
| Transformer | MW level 1 W at 200 cps | 0.95 x 1.66 x 0.218" |

SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: Nineteen components indicated less than 10% change.
One component indicated a change greater than 10% and less than 50%.

| | | |
|---|---|---|
| United Transformer | 80/100 Ω CT | Epoxy sealed |
| 50-T29 | 3.2/4 Ω CT | Metal clad |
| Transformer | MW level 300 | 0.4 x 0.31" diam. |

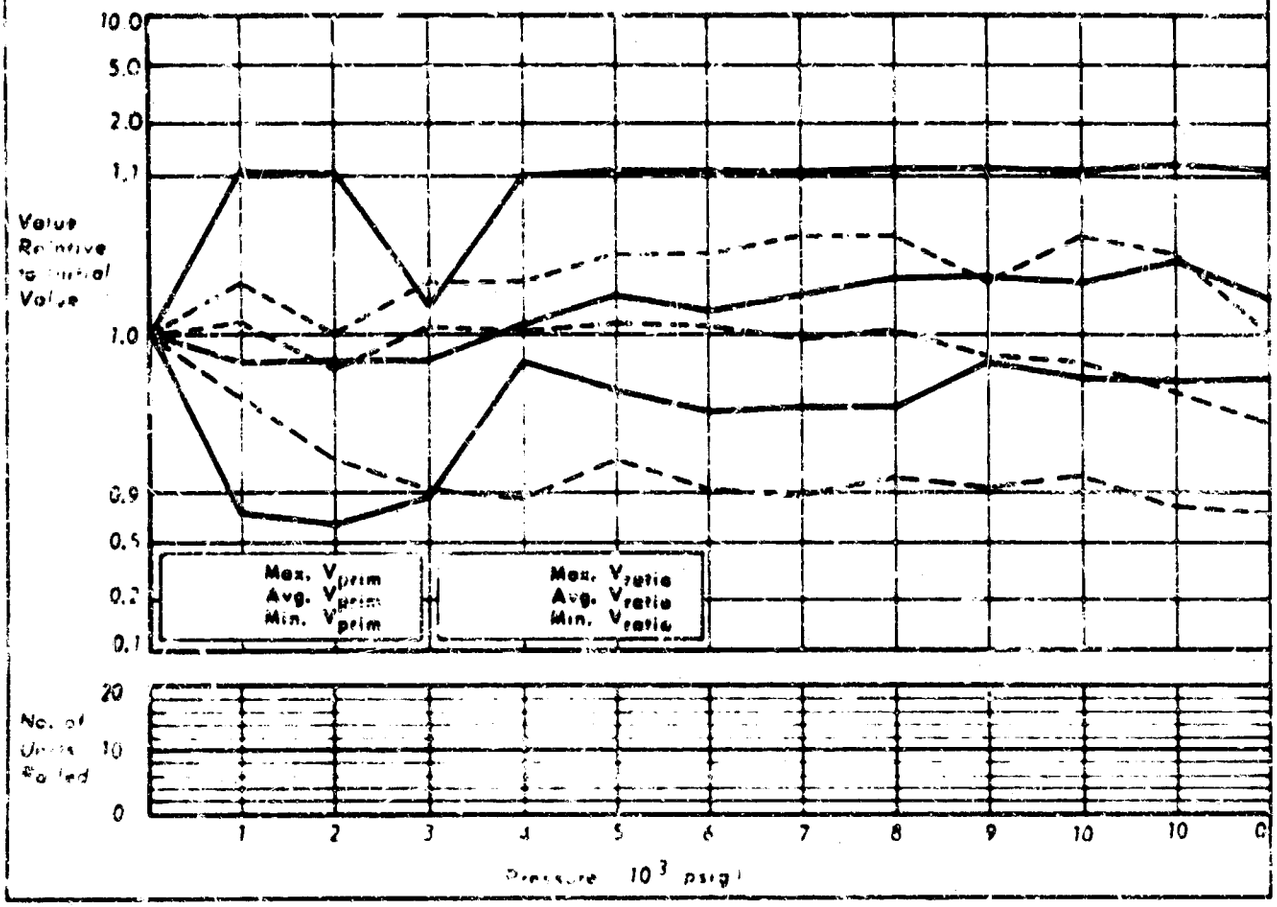
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: Seventeen components indicated less than 10% change. Two components indicated a change greater than 10% and less than 50%.

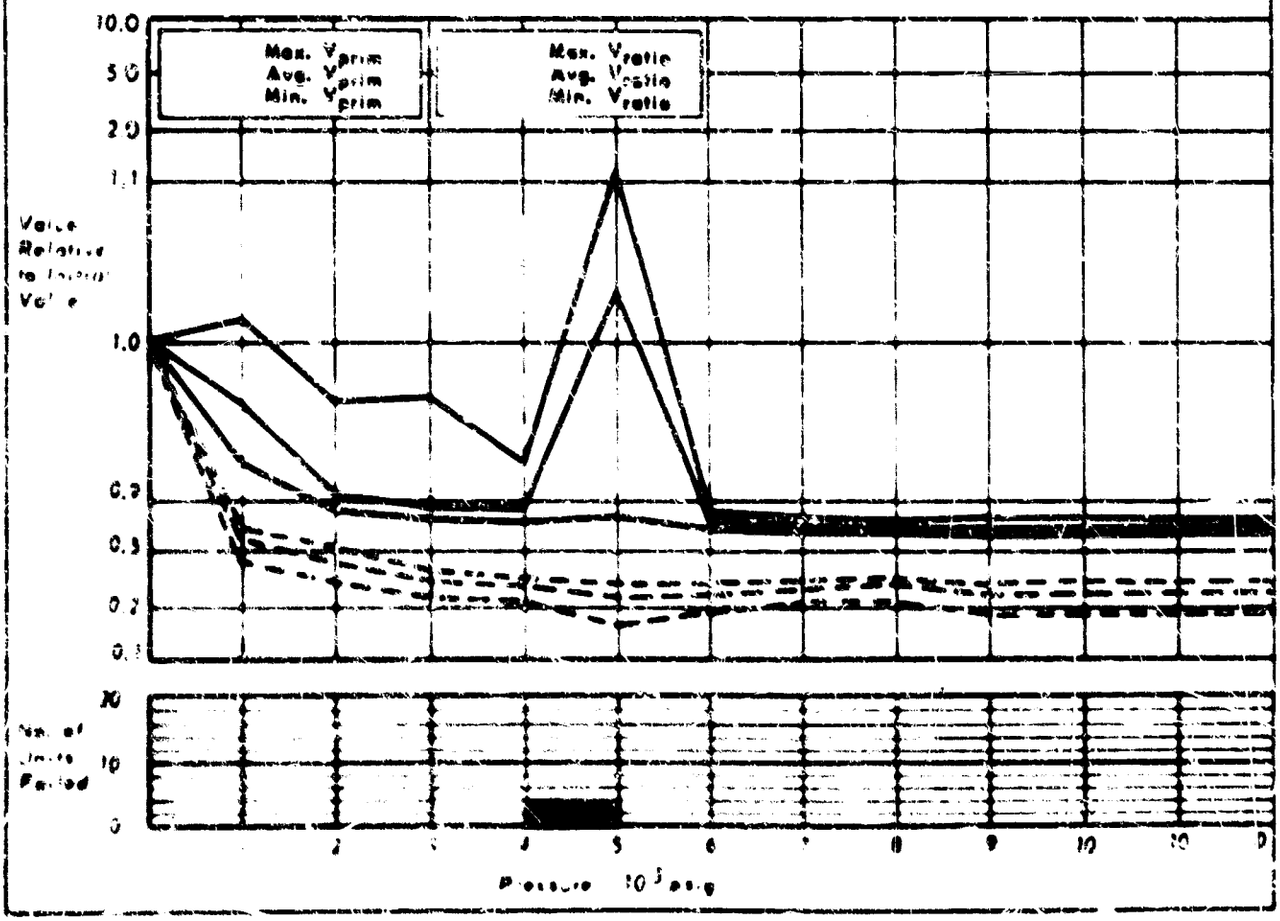
MFG.- UNITED TRANSFORMER
TYPE - TRANSFORMER
DESCRIPTION - D1 - T44

CHART NO. 143
NO. OF SAMPLES TESTED - 12




MFG.- UNITED TRANSFORMER
TYPE - TRANSFORMER
DESCRIPTION - D1 - T44

CHART NO. 144
NO. OF SAMPLES TESTED - 20



| | | |
|---|---|---|
| United transformer | 80/100 Ω CT | Epoxy sealed |
| DI-T44 | 32/40 Ω split | Metal clad |
| Transformer | kW level 500 | 0.43 x 0.312" diam. |

SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: Eleven components indicated less than 10% change.

One component indicated a change greater than 10% and less than 50%.

| | | |
|---|---|---|
| United transformer | 80/100 Ω CT | Molded unit |
| SO-14P | 32/40 Ω split | Vacuum impreg. |
| Transformer | | 0.75 x 1.0 x 0.719" |

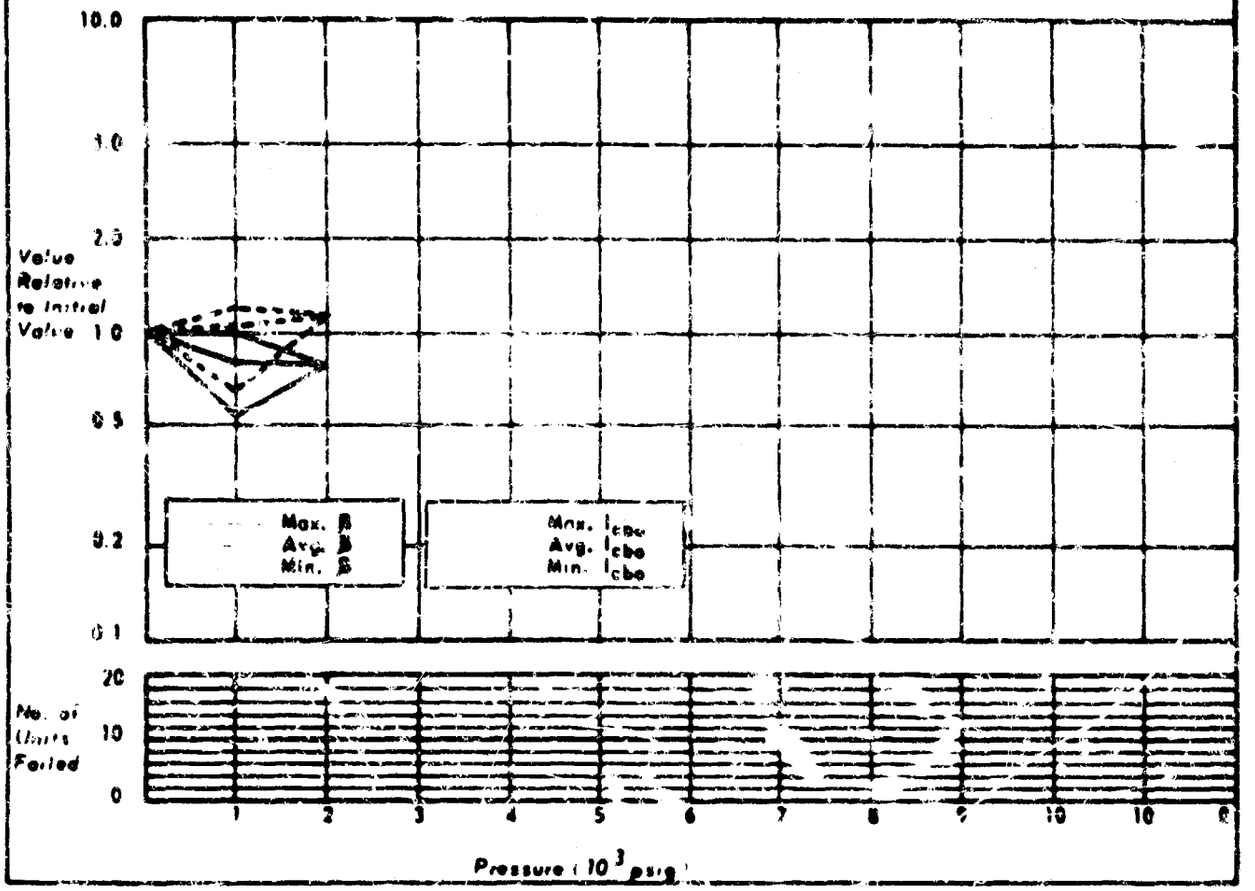
SOAK PERIOD: None

MECHANICAL: No apparent damage.

ELECTRICAL: All components indicated a change greater than 10% and less than 50%.

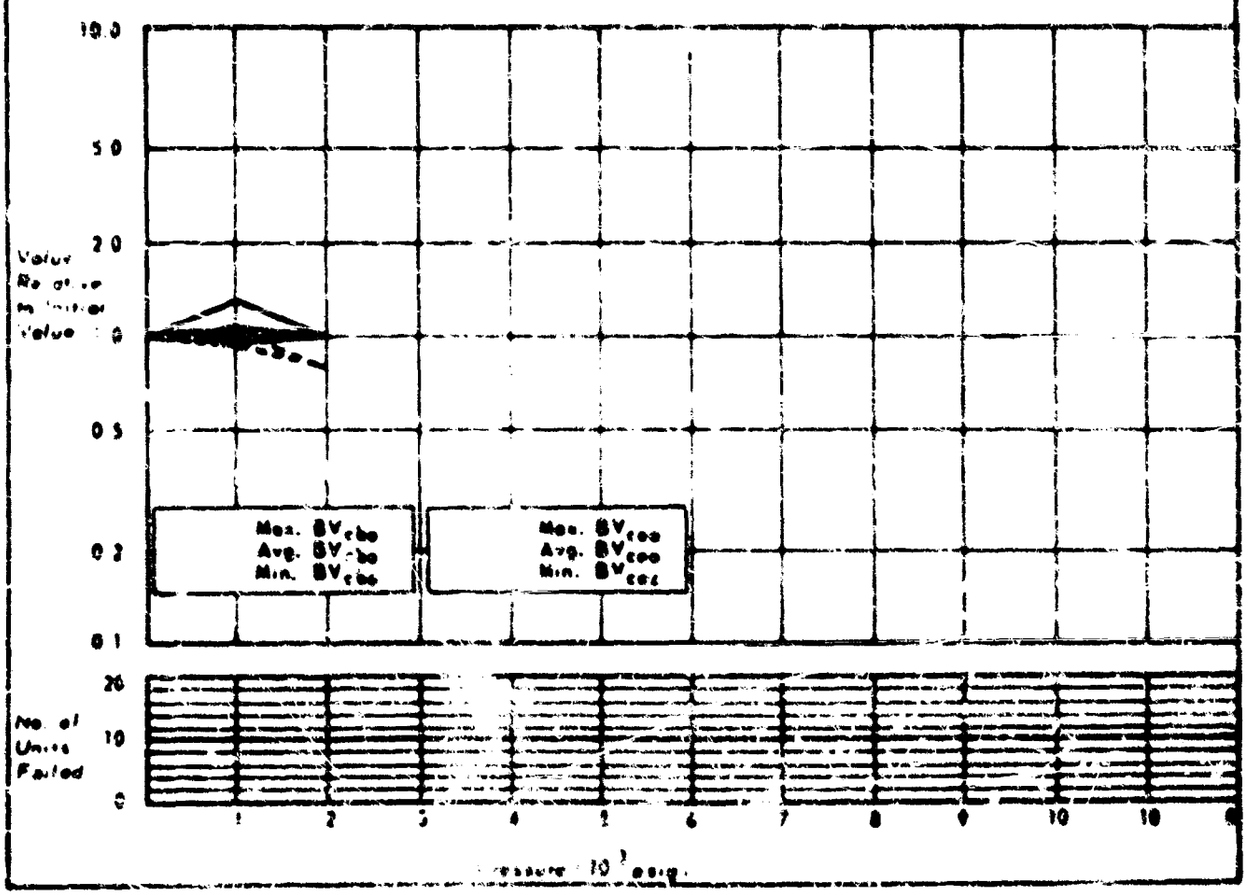
MFG. - GENERAL INSTRUMENT
TYPE - TRANSISTOR
DESCRIPTION - 2N599

CHART NO. 1453
NO. OF SAMPLES TESTED - 10




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 1454
NO. OF SAMPLES TESTED



General Instruments
2N 399
Translator

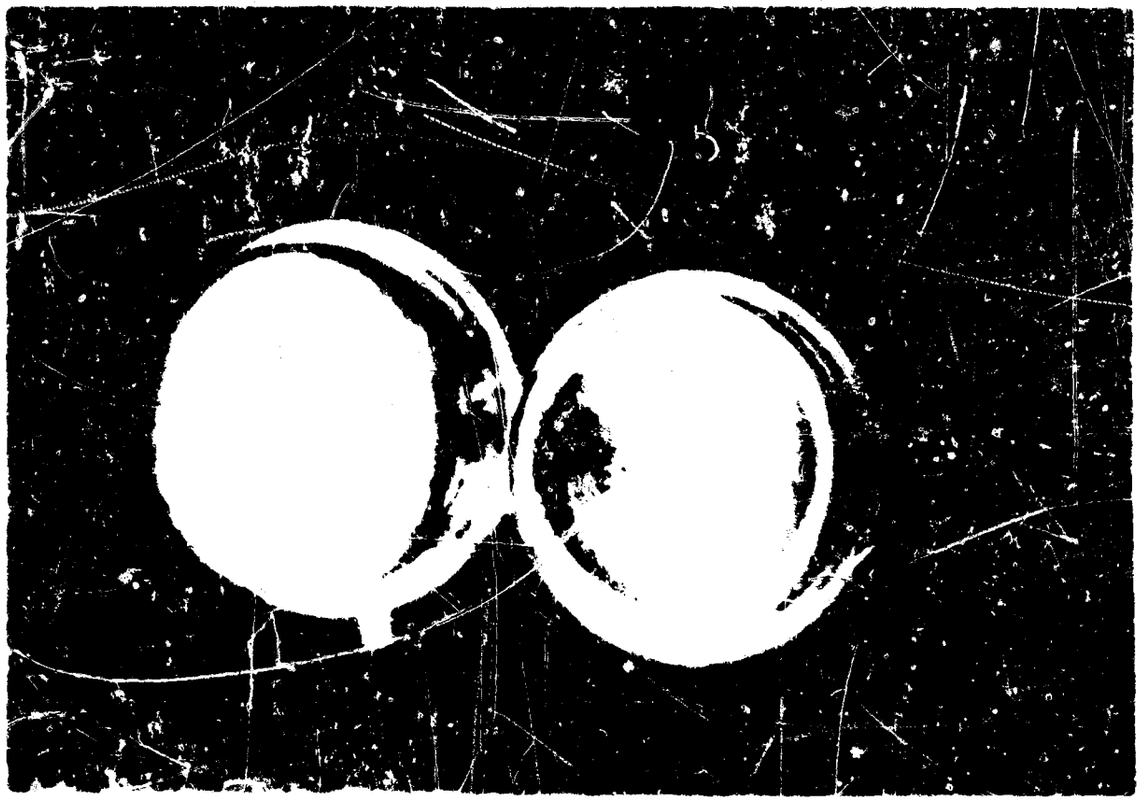
$I_{cbo}$ = 5 μA
$BV_{cbo}$ = 45 V

Germanium, PNP
Alloy Junction
0.25 x 0.36" diam

SOAK PERIOD: None

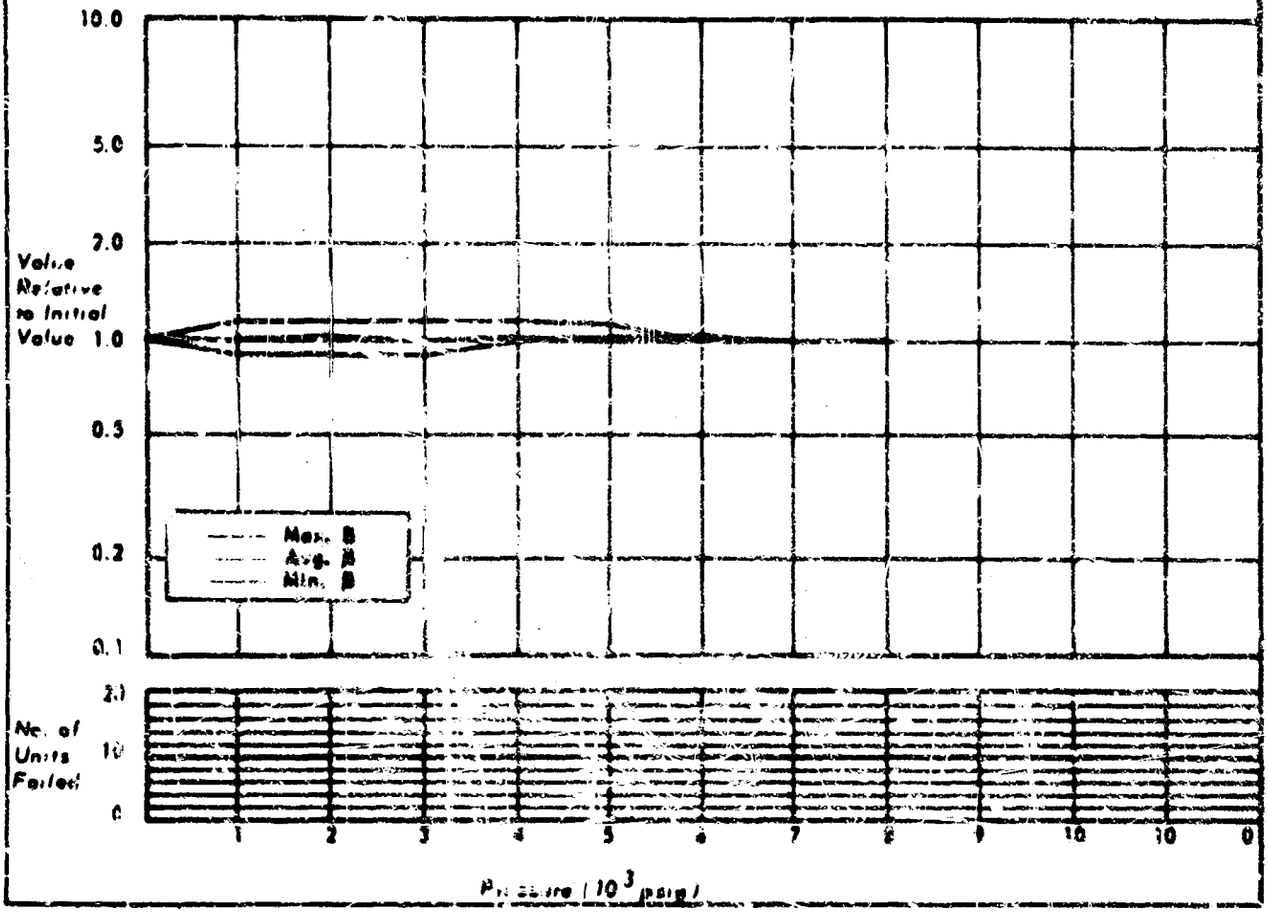
MECHANICAL: The metal cases of all components were deformed.

ELECTRICAL: All components operated with a change of more than 20% and less than 50% through 1,000 psig. One component operated through 2,000 psig. All samples failed above 2,000 psig. Failure in each case was catastrophic.



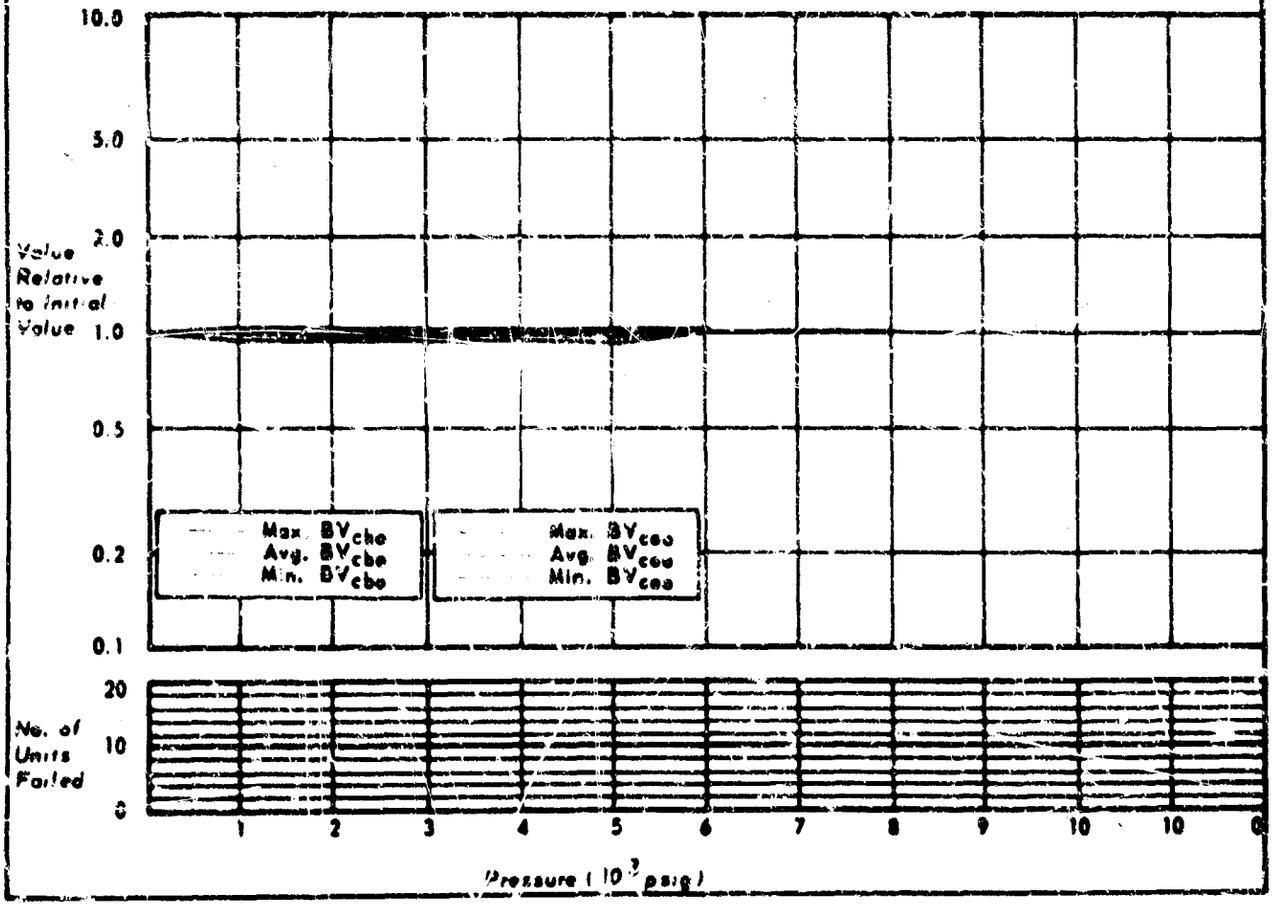
MFG. - GENERAL INSTRUMENTS
TYPE - TRANSISTOR
DESCRIPTION - 2N706

CHART NO. 146
NO. OF SAMPLES TESTED - 10




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 146A
NO. OF SAMPLES TESTED



General Instruments
2N 706
Transistor

$I_{cbo}$ 0.01 μA
$BV_{cbo}$ 25 V

Silicon, NPN
Planar, epitaxial
TO case
0.20 x 0.21" diam

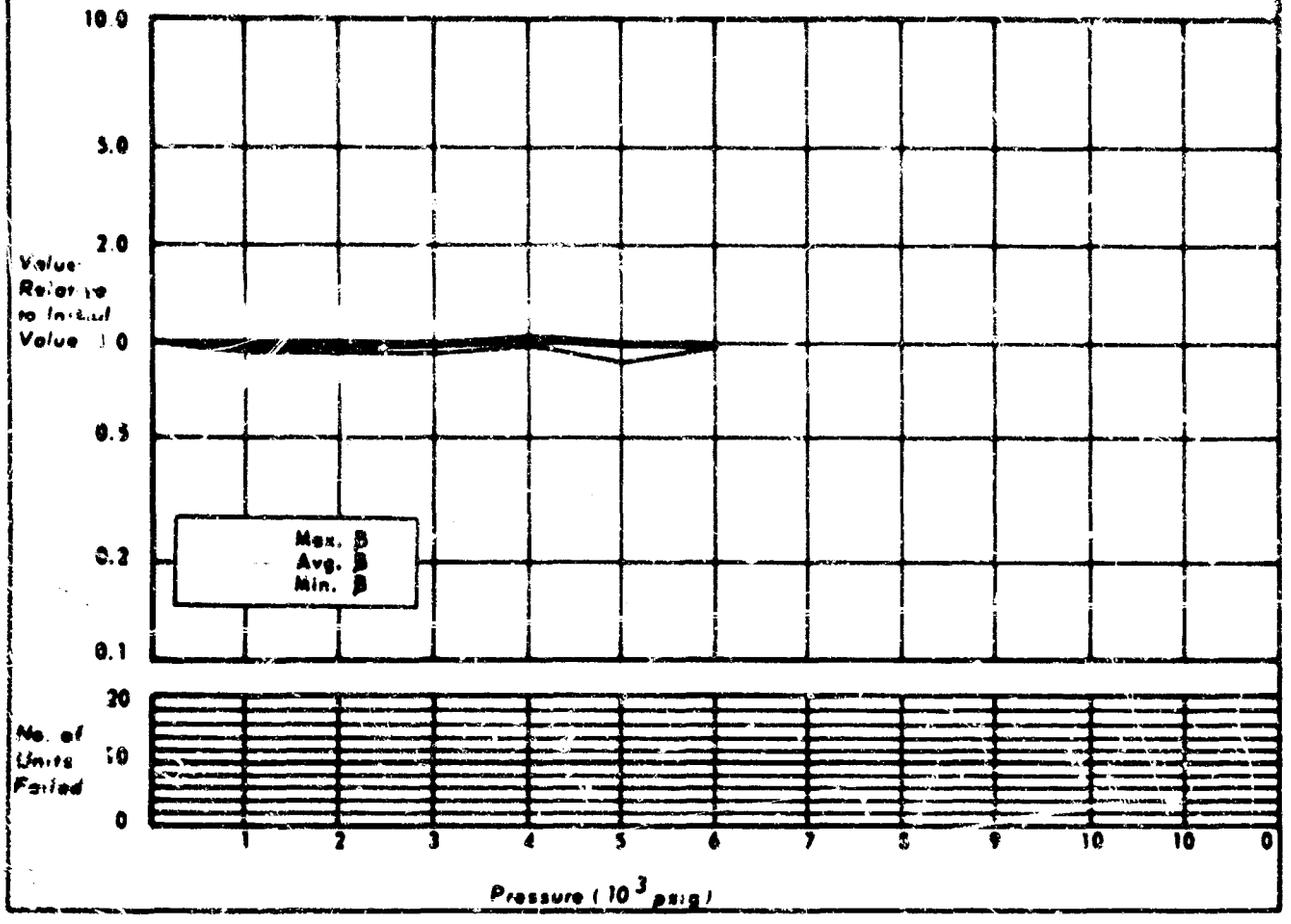
SOAK PERIOD: None

MECHANICAL: The metal cases of all components were deformed.

ELECTRICAL: All components functioned normally through 4,000 psig, eleven operated through 5,000 psig, eight through 6,000 psig and two through 7,000 psig. All components failed above 7,000 psig. Failure in each case was catastrophic.

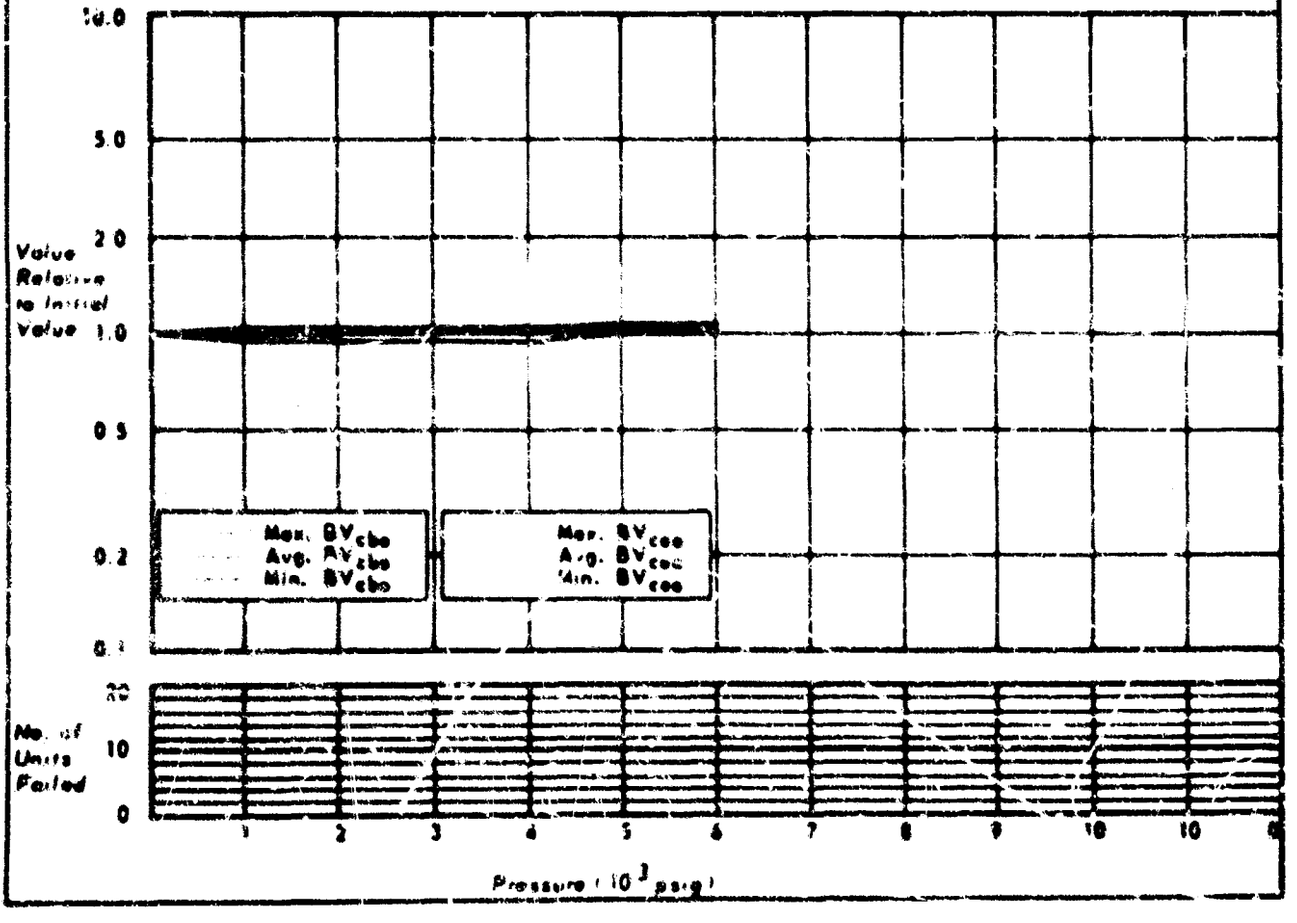
MFG. - MOTOROLA
TYPE - TRANSISTOR
DESCRIPTION - 2N834

CHART NO. 147
NO. OF SAMPLES TESTED - 20




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 147A
NO. OF SAMPLES TESTED



Motorola
2N 834
Transistor

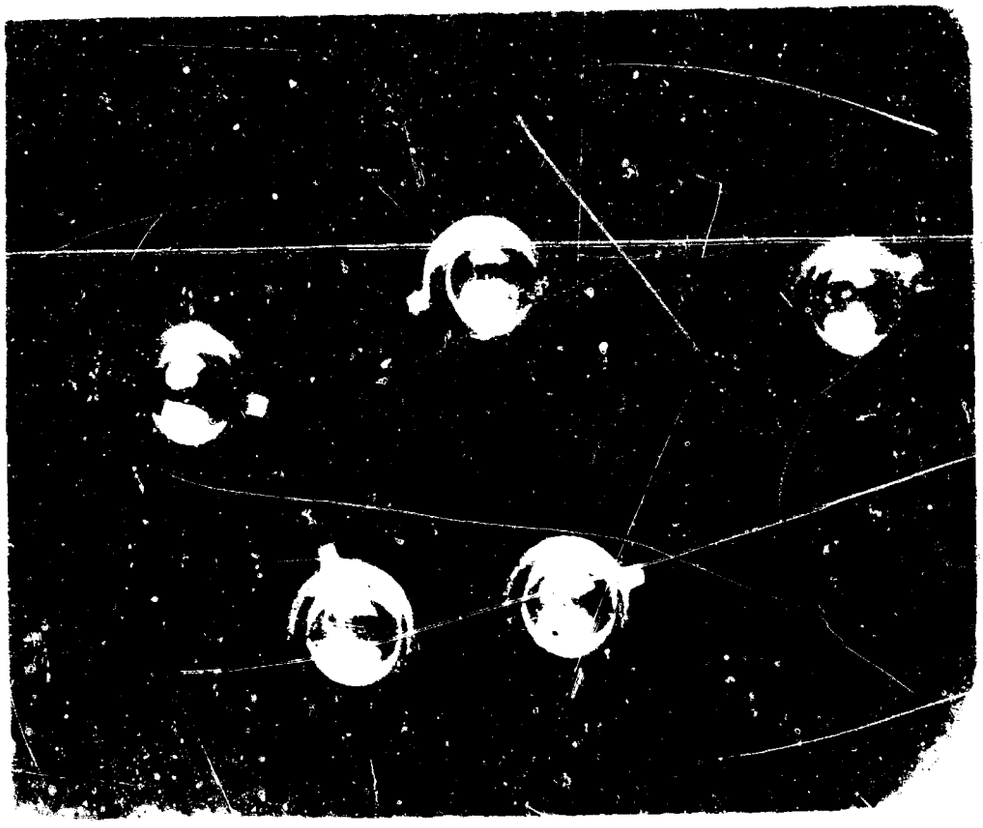
$I_{cbo}$ 6 μA
$BV_{cbo}$ 40 V

Silicon, NPN
Epitaxial mesa

**SOAK PERIOD:** None

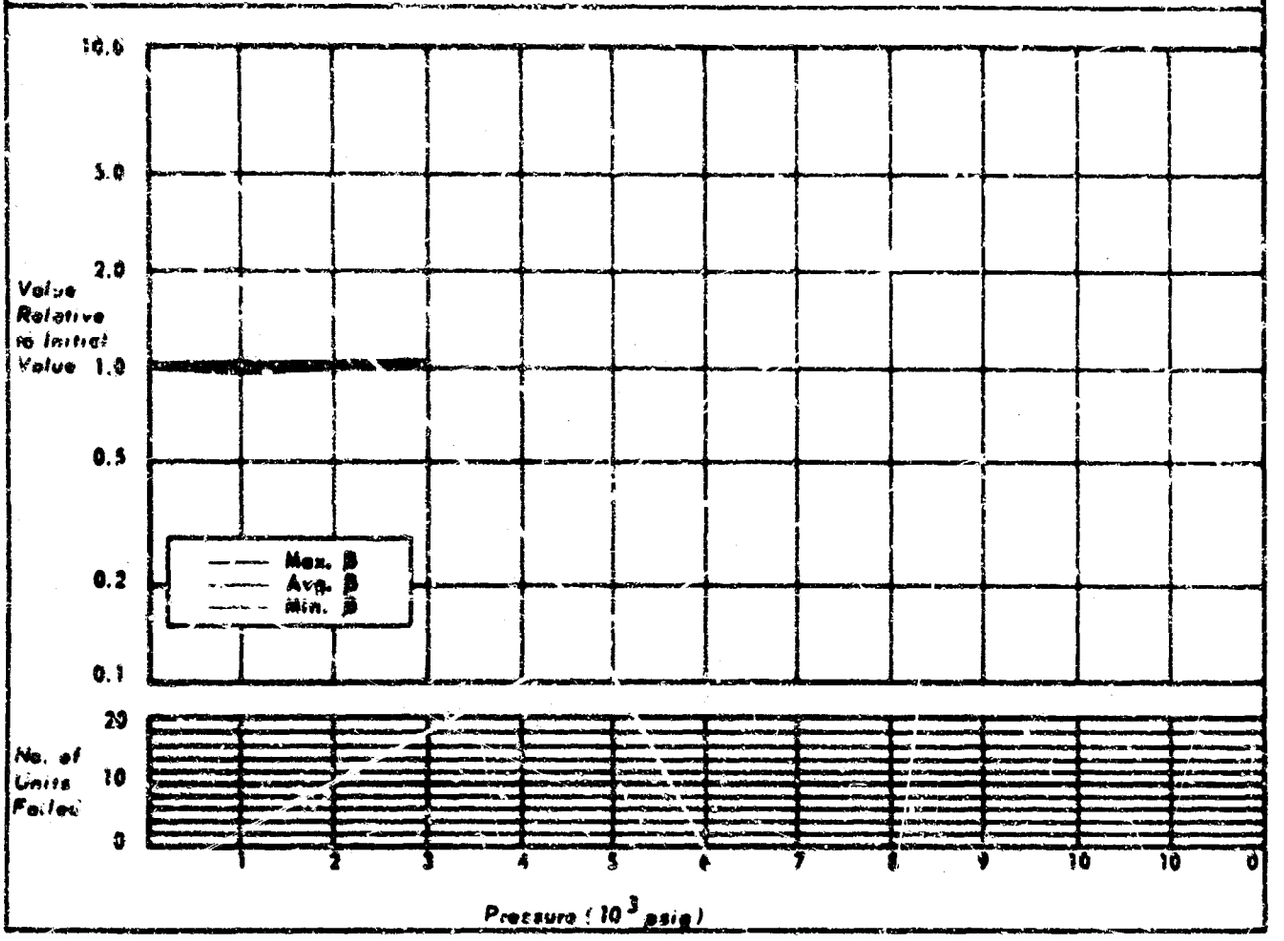
**MECHANICAL:** All metal cases were deformed.

**ELECTRICAL:** All components operated with less than 10% change through 4,000 psig, thirteen operated through 5,000 psig and six operated with less than 25% change through 6,000 psig. All failures were catastrophic.



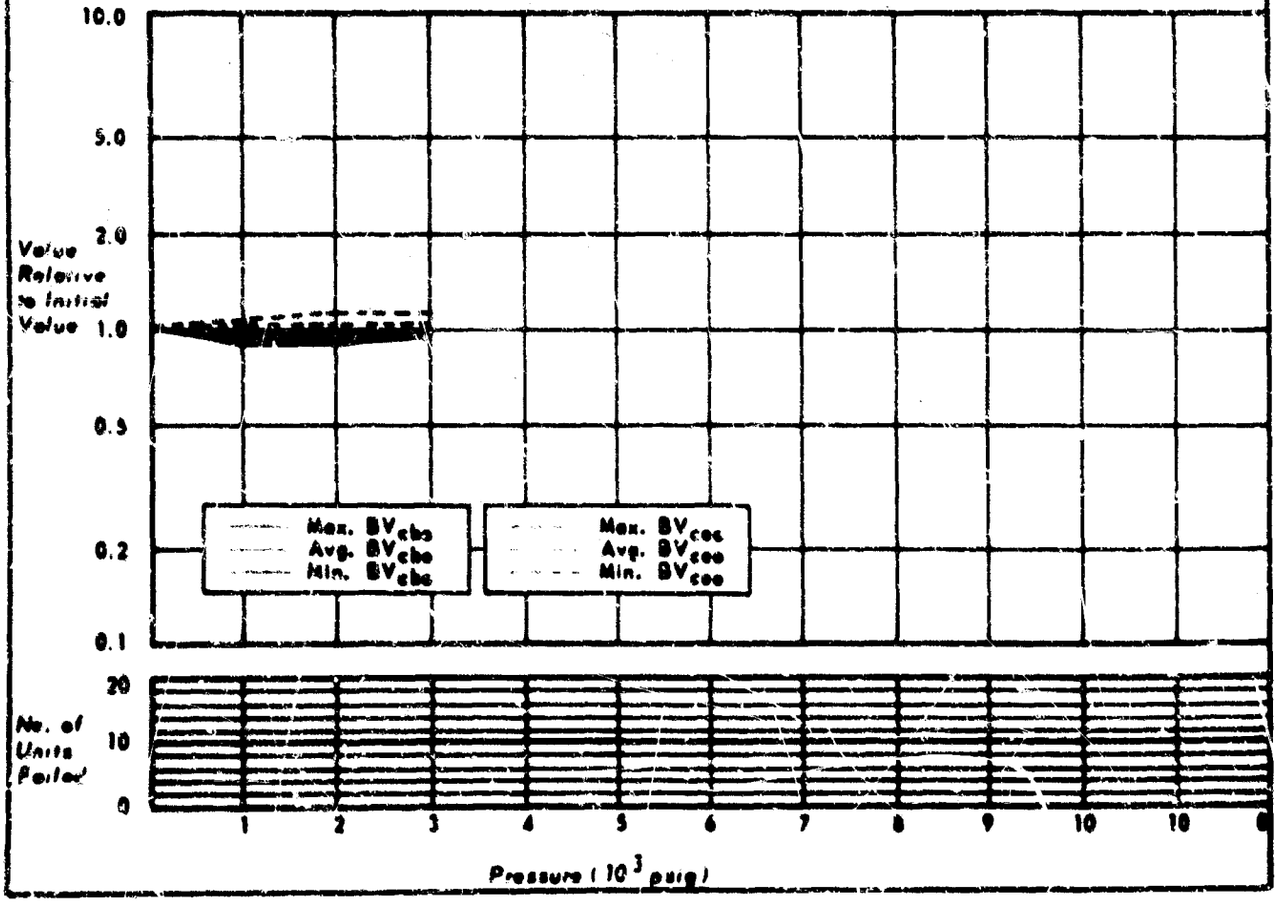
MFG. - MOTOROLA
TYPE - TRANSISTOR
DESCRIPTION - 2N2218

CHART NO. 148
NO. OF SAMPLES TESTED - 19




MFG.
TYPE
DESCRIPTION

CHART NO. 148A
NO. OF SAMPLES TESTED



Motorola
2N 3218
Transistor

$I_{cbo}$ = .01 μA
$BV_{cbo}$ = 40 V

Silicon, NPN
Annular epitaxial

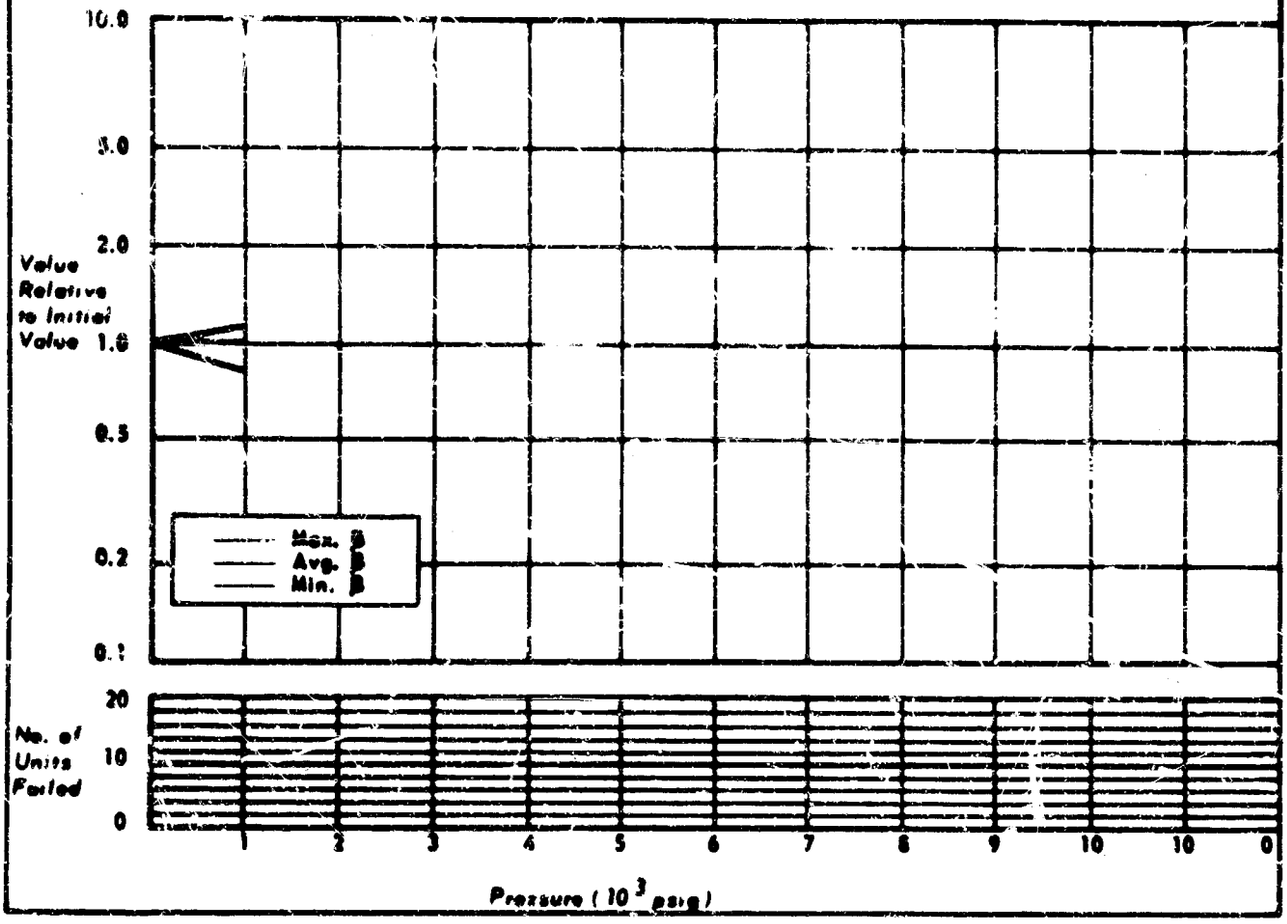
SOAK PERIOD: None

MECHANICAL: All metal cases were deformed.

ELECTRICAL: All components operated with less than 10% change through 2,000 psig and nine with less than 10% change through 3,000 psig. All failures were catastrophic.

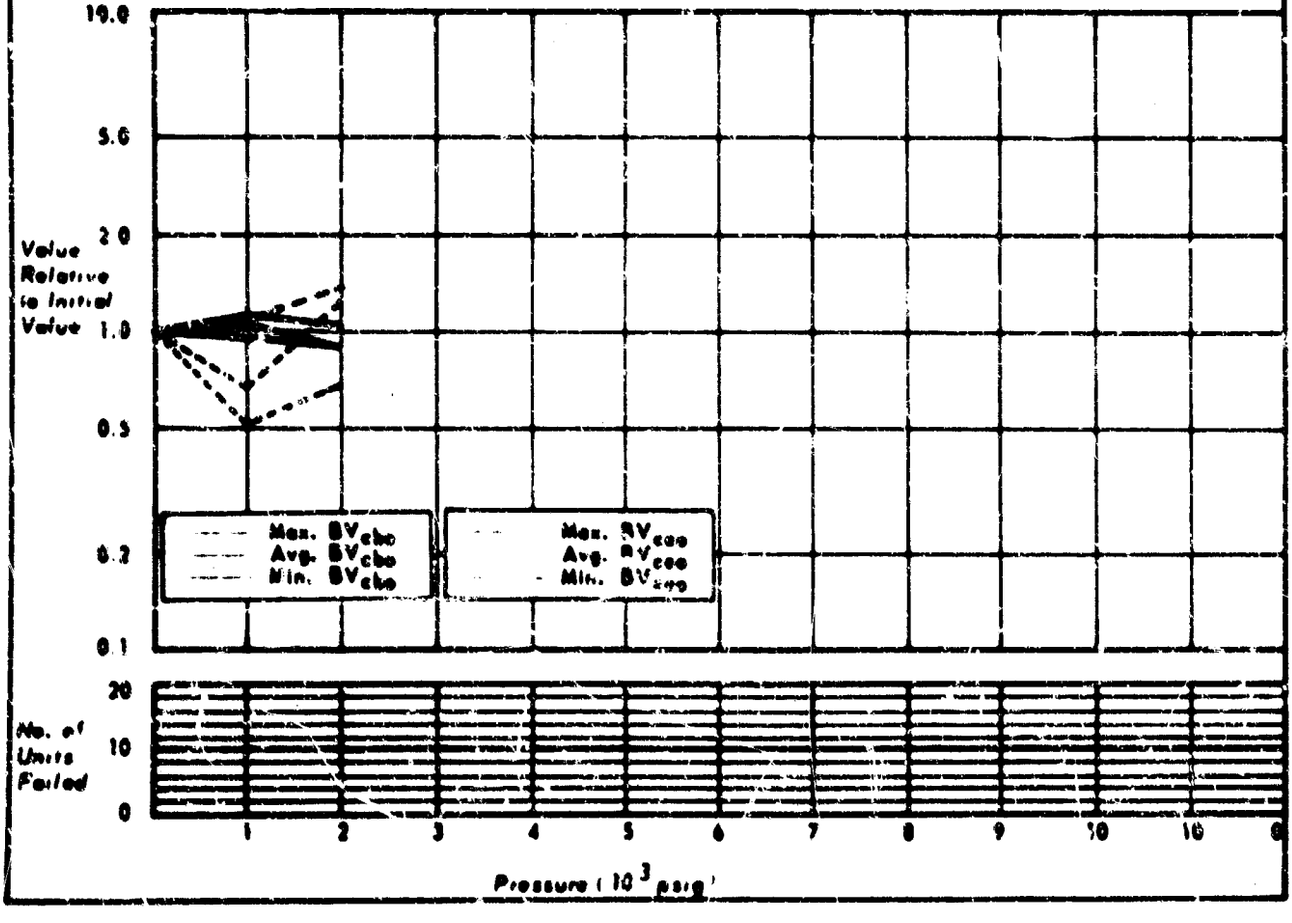
MFG.: SYLVANIA
TYPE: TRANSISTOR
DESCRIPTION: 2N706B

CHART NO. 149
NO. OF SAMPLES TESTED: 20




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 149A
NO. OF SAMPLES TESTED



Sylvania
2N 7045
Transistor

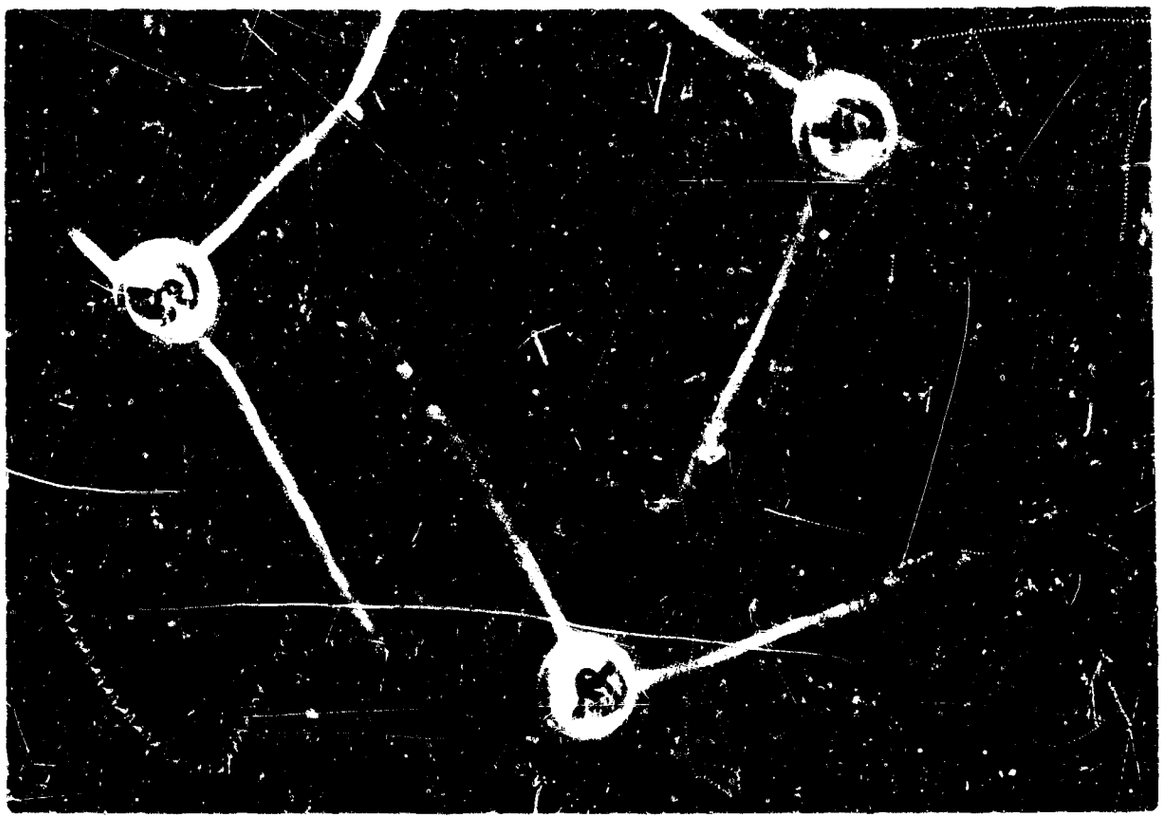
$I_C$ = 200 mA
$V_{cbo}$ = 25 V

NPN Silicon
Epitaxial planar
Diffused, passivated
0.205 x 0.21" diam.

**SOAK PERIOD:** None

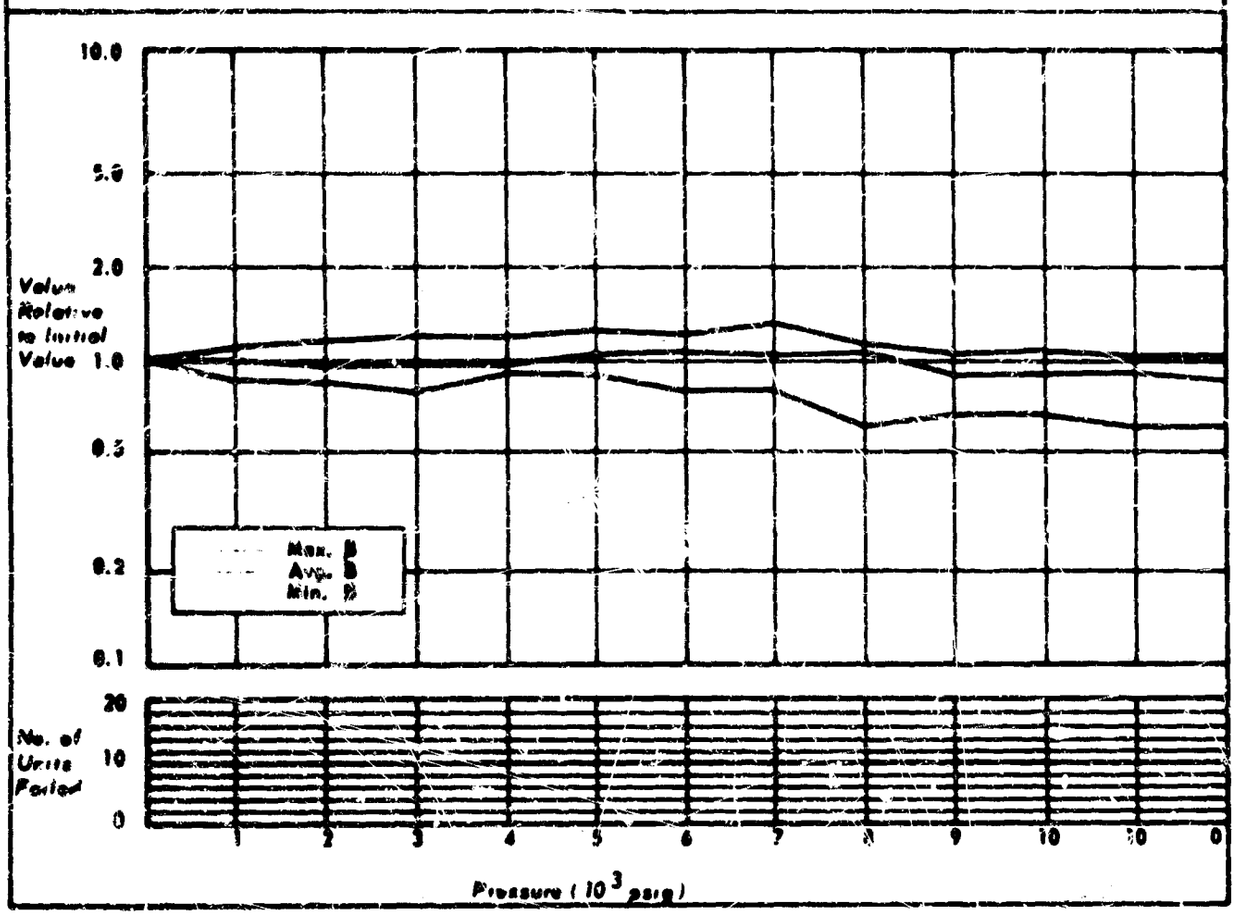
**MECHANICAL:** All metal cases were deformed.

**ELECTRICAL:** All components functioned normally through 2000 psig. Two components failed completely above 2000 psig and the remaining eighteen indicated incipient failure. All components failed above 3000 psig.



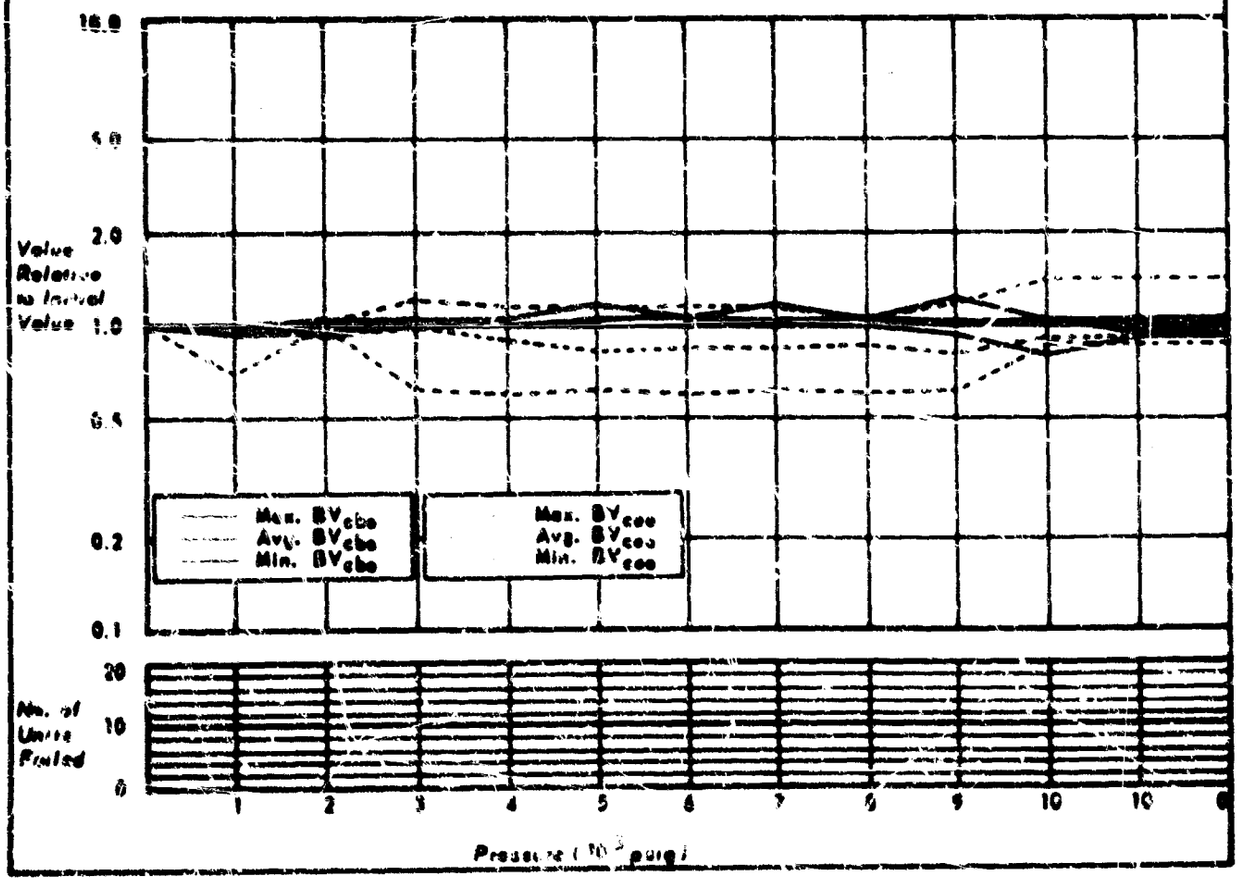
MFG. - SYLVANIA
TYPE - TRANSISTOR
DESCRIPTION - 2N4131

CHART NO. 150
NO. OF SAMPLES TESTED - 8




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 150A
NO. OF SAMPLES TESTED



| | | |
|---|---|---|
| Sylvania | $I_{cbo}$ = 1 μA | Silicon, NPN |
| 2N 4131 | $BV_{cbo}$ = 20 V | Planar epitaxial |
| Transistor | | Epoxy encap |

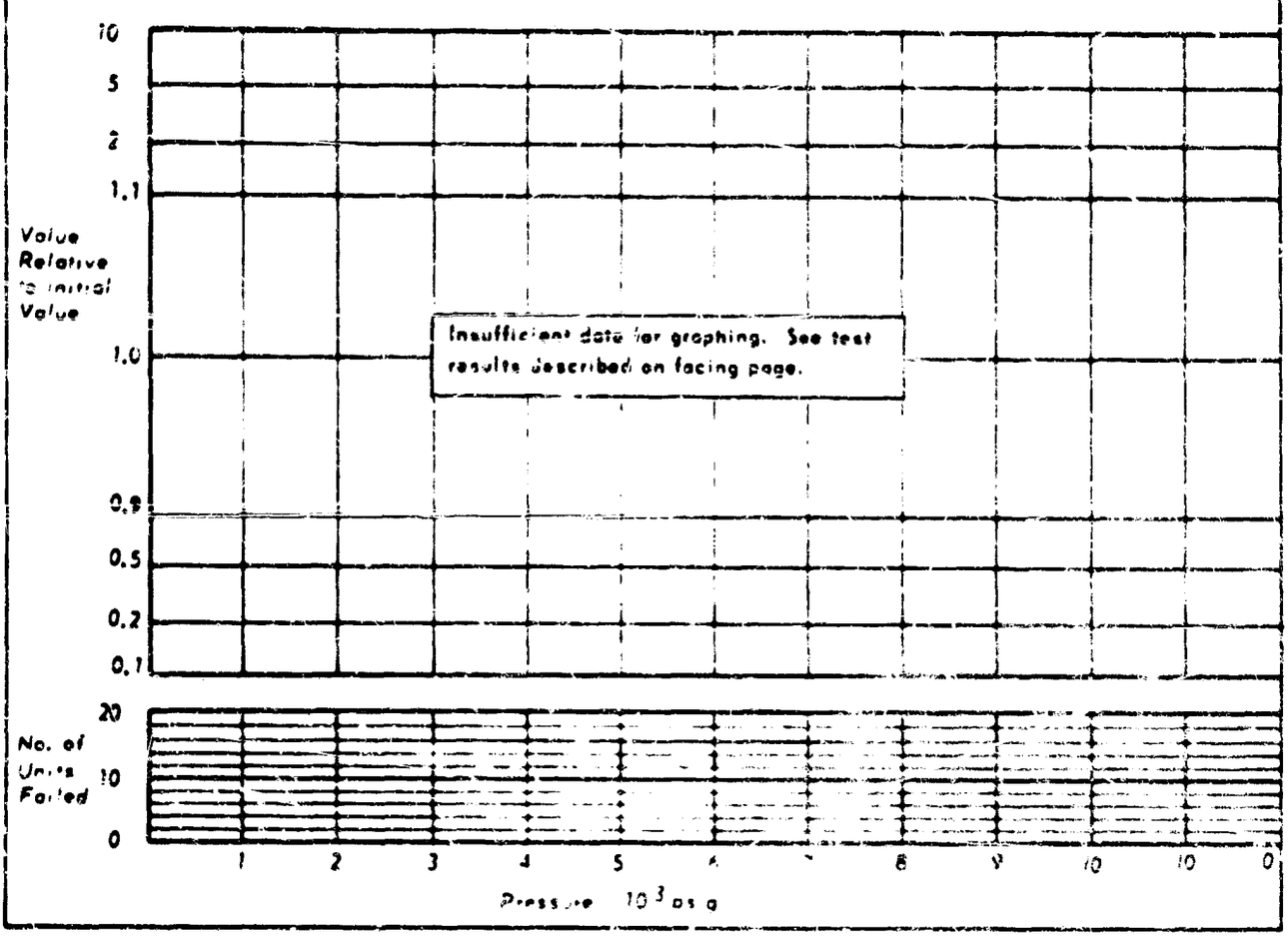
**SOAK PERIOD:** None

**MECHANICAL:** All metal cases were deformed.

**ELECTRICAL:** Six components functioned satisfactorily through the entire test program.
Two components failed above 7,000 psig.

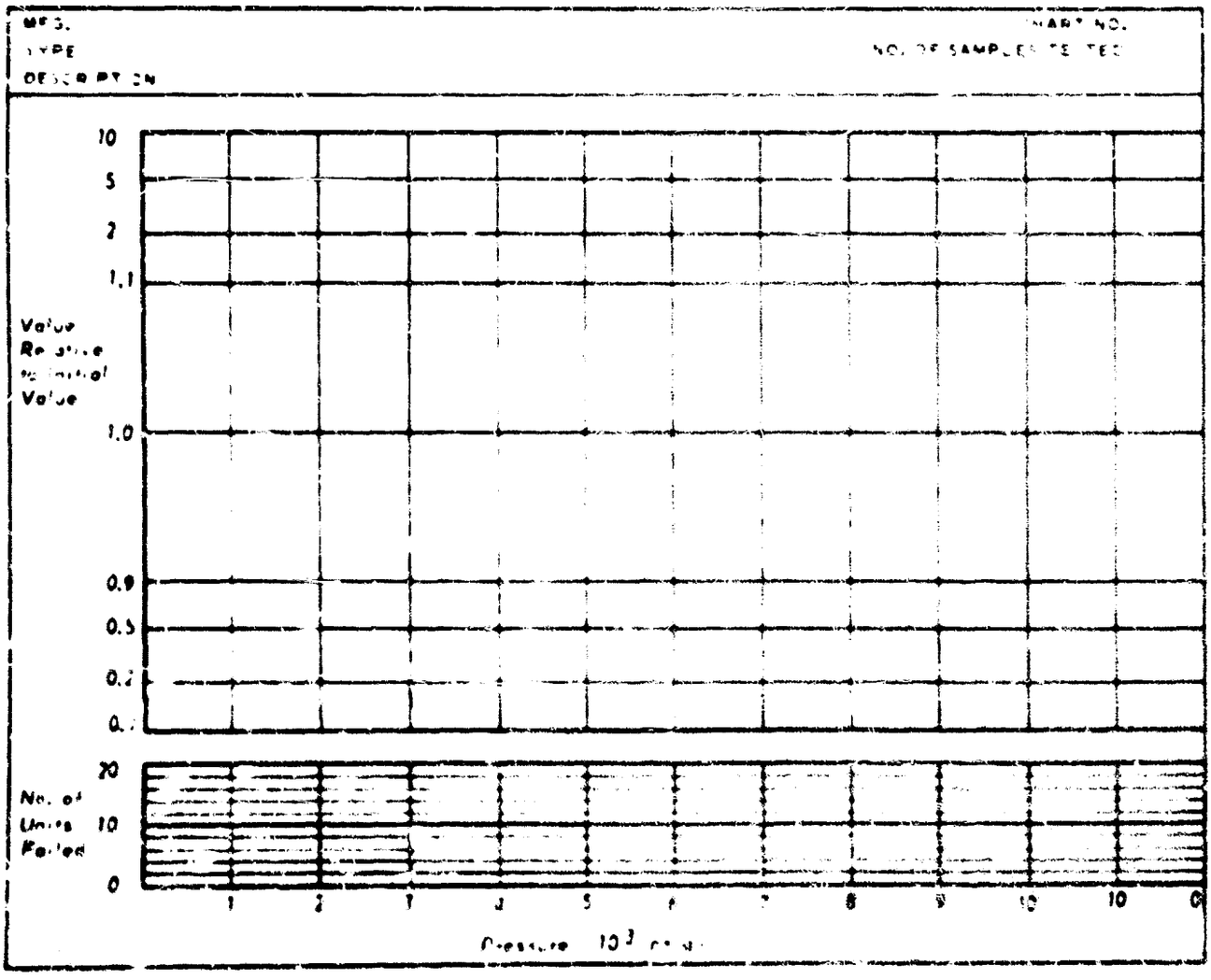
MFG. - SYLVANIA
TYPE - TRANSISTOR
DESCRIPTION - SYL4542

CHART NO. 131
NO. OF SAMPLES TESTED




MFG.
TYPE
DESCRIPTION

CHART NO.
NO. OF SAMPLES TESTED



Sylvania
SYL4342
Transistor

$I_{cbo}$ = 5 μA
$BV_{cbo}$ = 15 V

Silicon, epitaxial planar
Diffused, passivated
Kovar top mounting
0.04 x 0.02 x 0.005"

**SOAK PERIOD:** 16 hours at 10,000 psig.

Due to the extremely small size of the components, functional operation was impossible during test. The laboratory facilities available were also considered inadequate for evaluation following test. The components were therefore subjected to the entire test program and subsequently returned to the vendor for operational check. The following information was received from Sylvania.

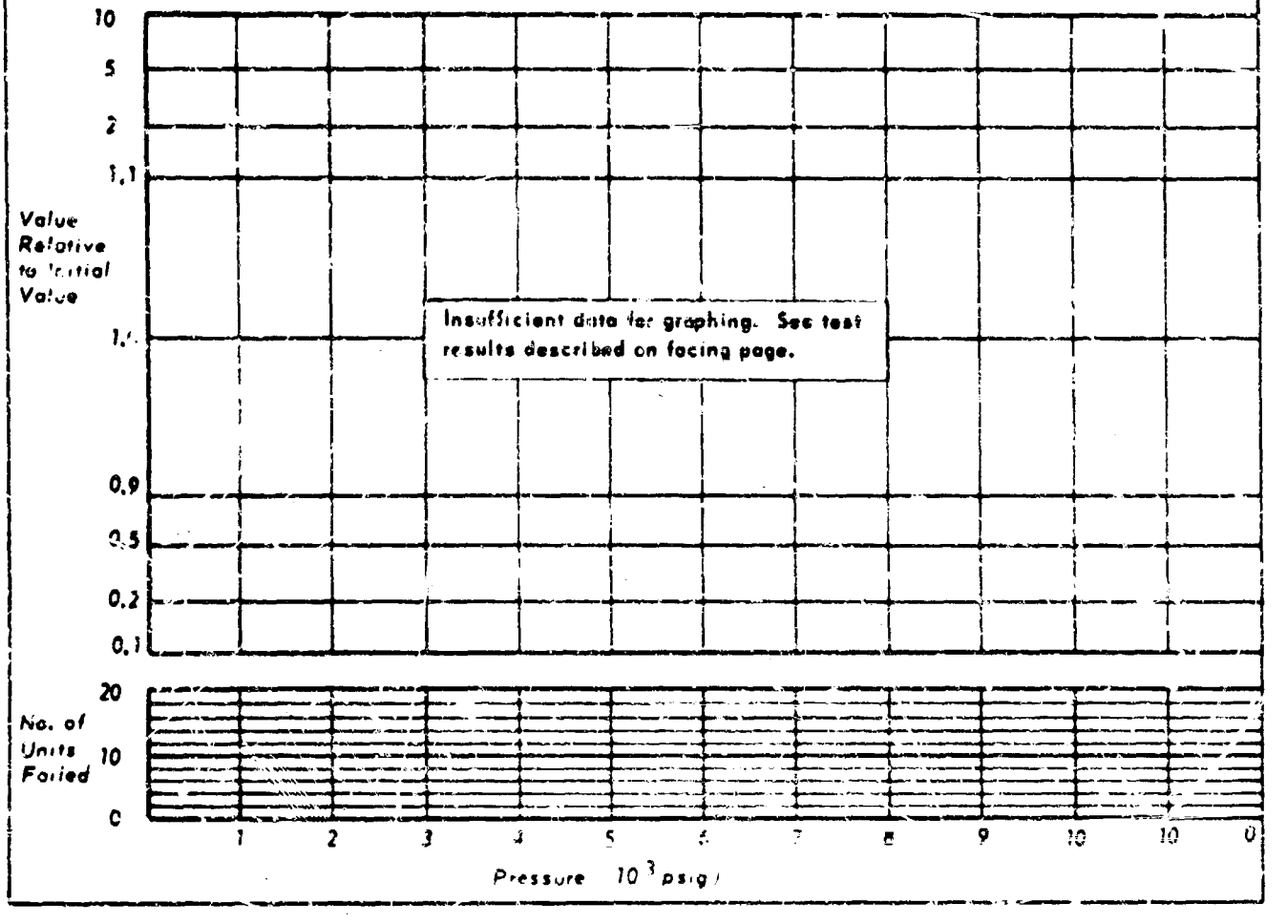
All units were examined microscopically. It was found that the aluminum metallization of all units displayed a black corrosion, which made electrical contact to some of the units impossible. However, electrical contact was successfully made to the large majority of the units without removal of the corrosion. The following electrical characteristics were measured by probing:

| | | | Min. | Med. | Max. | Units |
|---|---|---|---|---|---|---|
| $BV_{cbo}$ | @ | 10 μA | 25 | 27.5 | 30 | volts |
| $BV_{cbo}$ | @ | 100 μA | 26 | 28 | 30 | volts |
| $BV_{ebo}$ | @ | 10 μA | 5.0 | 5.1 | 5.3 | volts |
| $BV_{ebo}$ | @ | 100 μA | 5.1 | 5.1 | 7.0 | volts |
| $h_{FE}$ | @ | 0.5 V, 10 mA | 51 | 63 | 83 | |

Thus, it appears from probe readings that all units are good electrically. Although the corrosion on the metallization does not appear to affect the devices' electrical characteristics, it could cause problems in making contacts to other components. This corrosion problem can probably be overcome, however, if, after wire leads are bonded to the contact areas, a protective coating such as glass or epoxy is applied to the units.

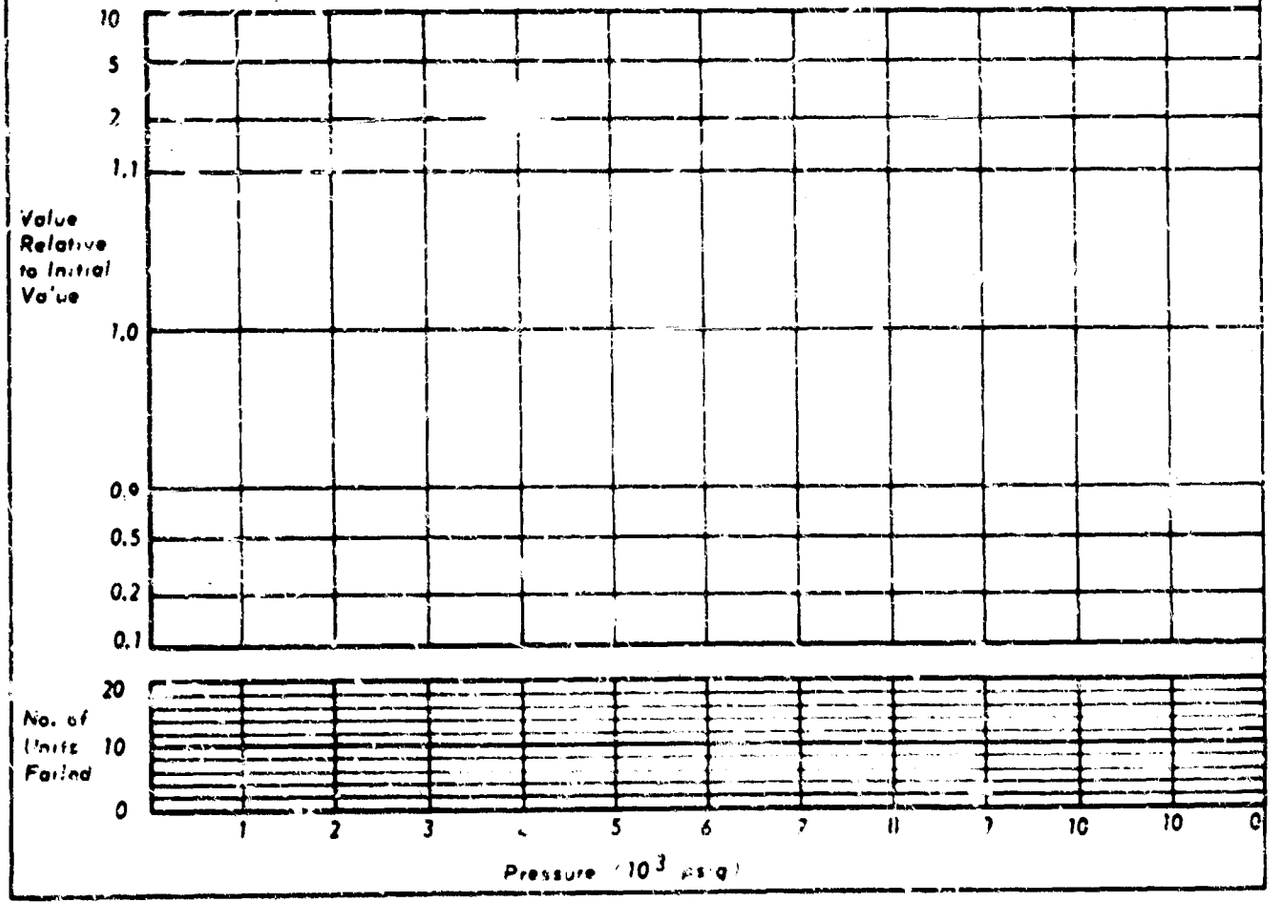
MFG. TEXAS INSTRUMENTS
TYPE - TRANSISTOR
DESCRIPTION - 2N743

CHART NO. 152
NO. OF SAMPLES TESTED




MFG.
TYPE
DESCRIPTION

CHART NO.
NO. OF SAMPLES TESTED



Texas Instruments
2N 743
Transistor

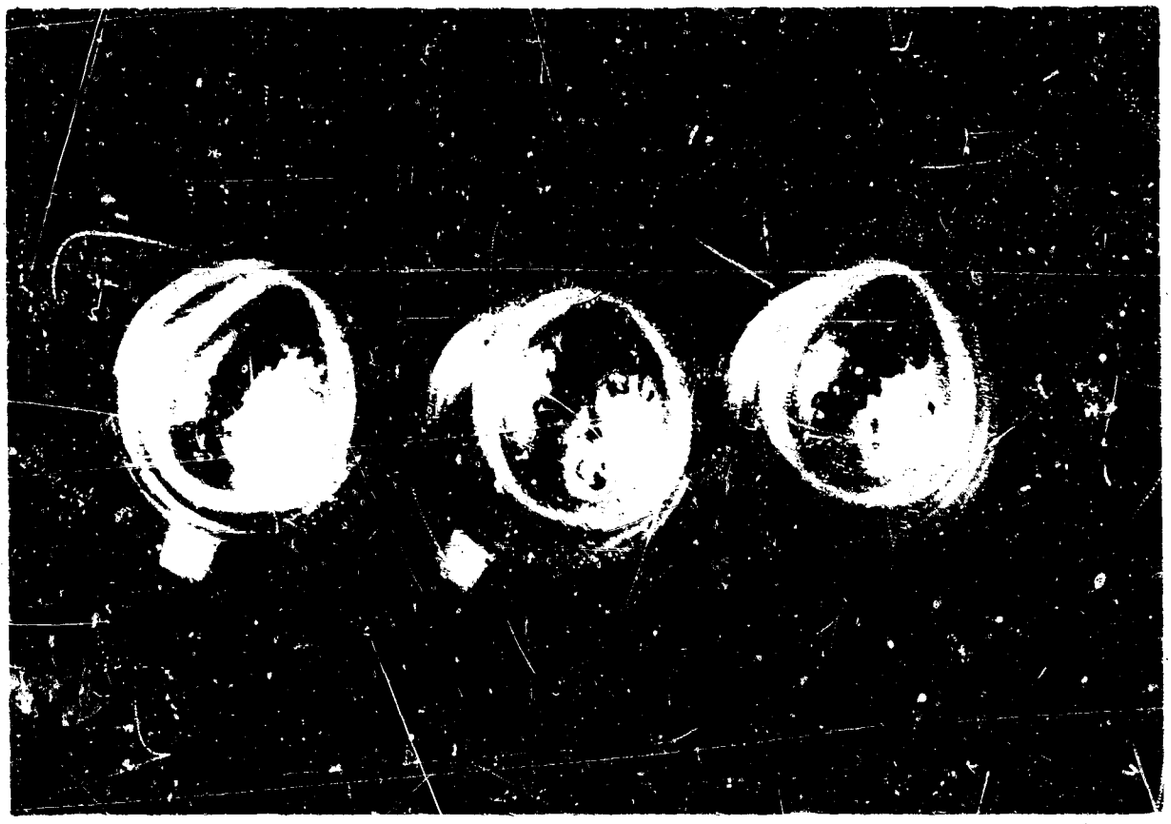
$I_{cbo}$ = 1 μA
$BV_{cbo}$ = 20 V

NPN epitaxial
Diffused mesa silicon

SOAK PERIOD: None

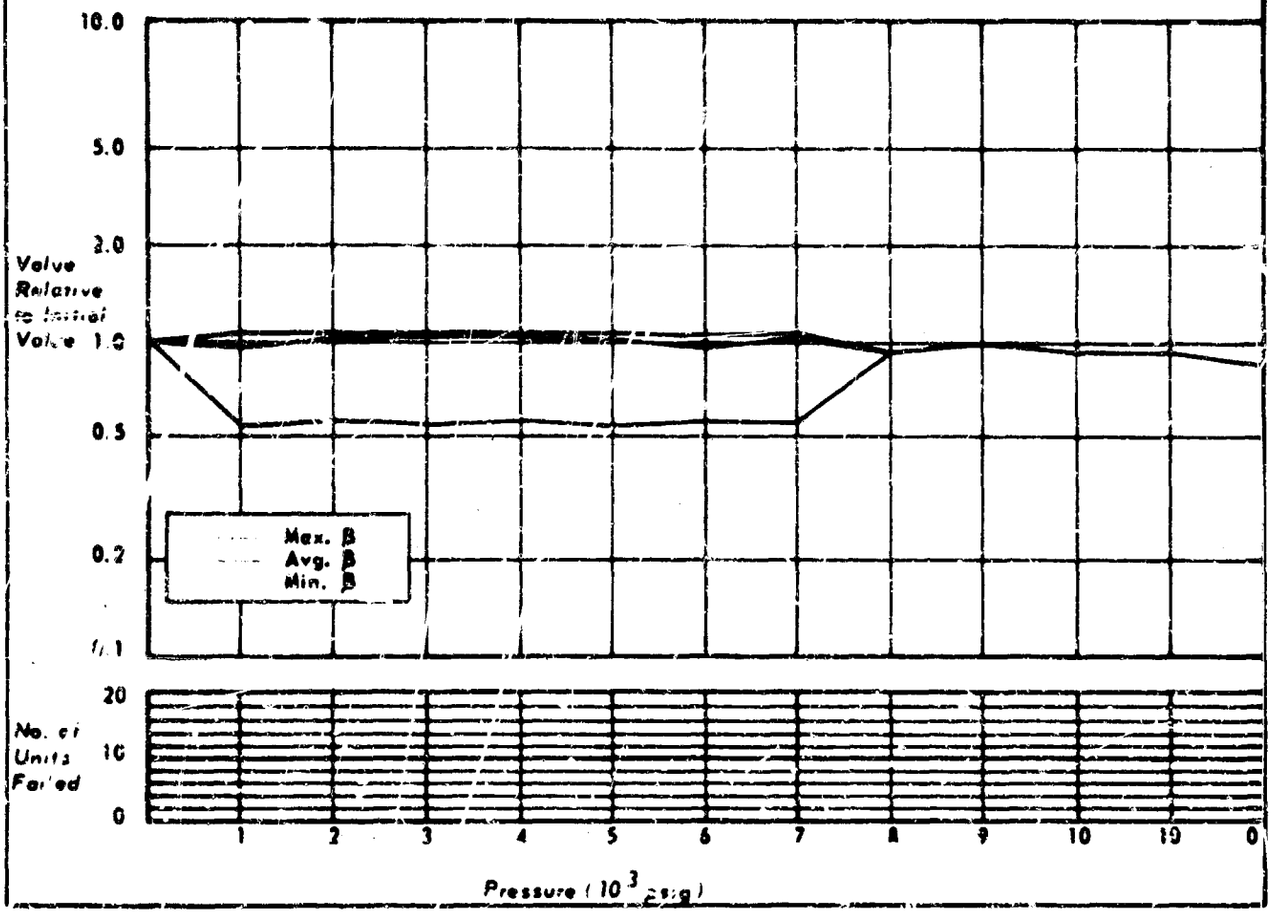
MECHANICAL: All metal cases were deformed.

ELECTRICAL: After completion of test it was noted that instrumentation problems had given invalid readings on all except one transistor. That component operated through 3,000 psig, failing between 3,000 and 4,000 psig.



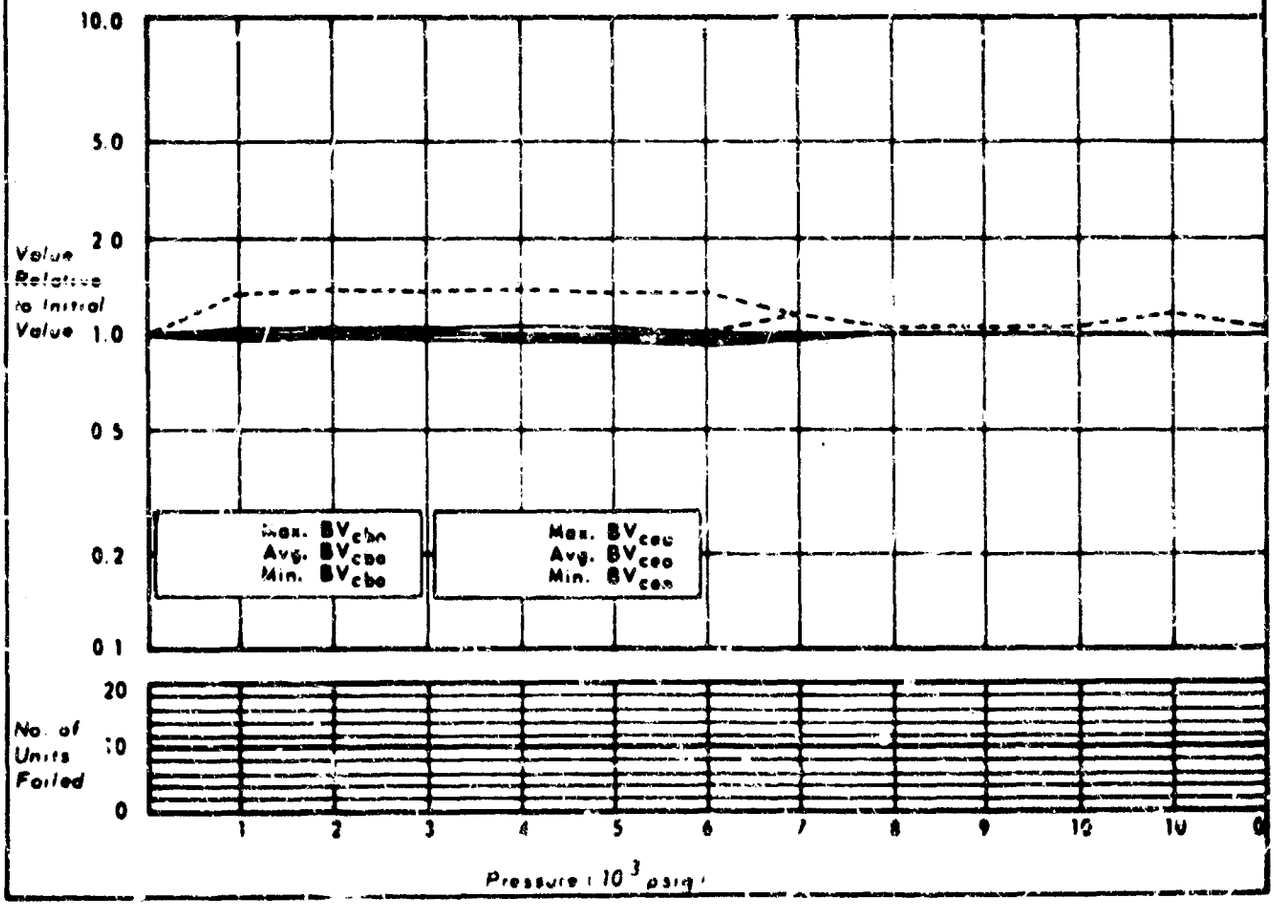
MFG. - TEXAS INSTRUMENT
TYPE - TRANSISTOR
DESCRIPTION - 2N2861

CHART NO. 153
NO. OF SAMPLES TESTED - 3




MFG.
TYPE
DESCRIPTION (SAME AS ABOVE)

CHART NO. 153A
NO. OF SAMPLES TESTED



Texas Instruments
2N 2861
Transistor

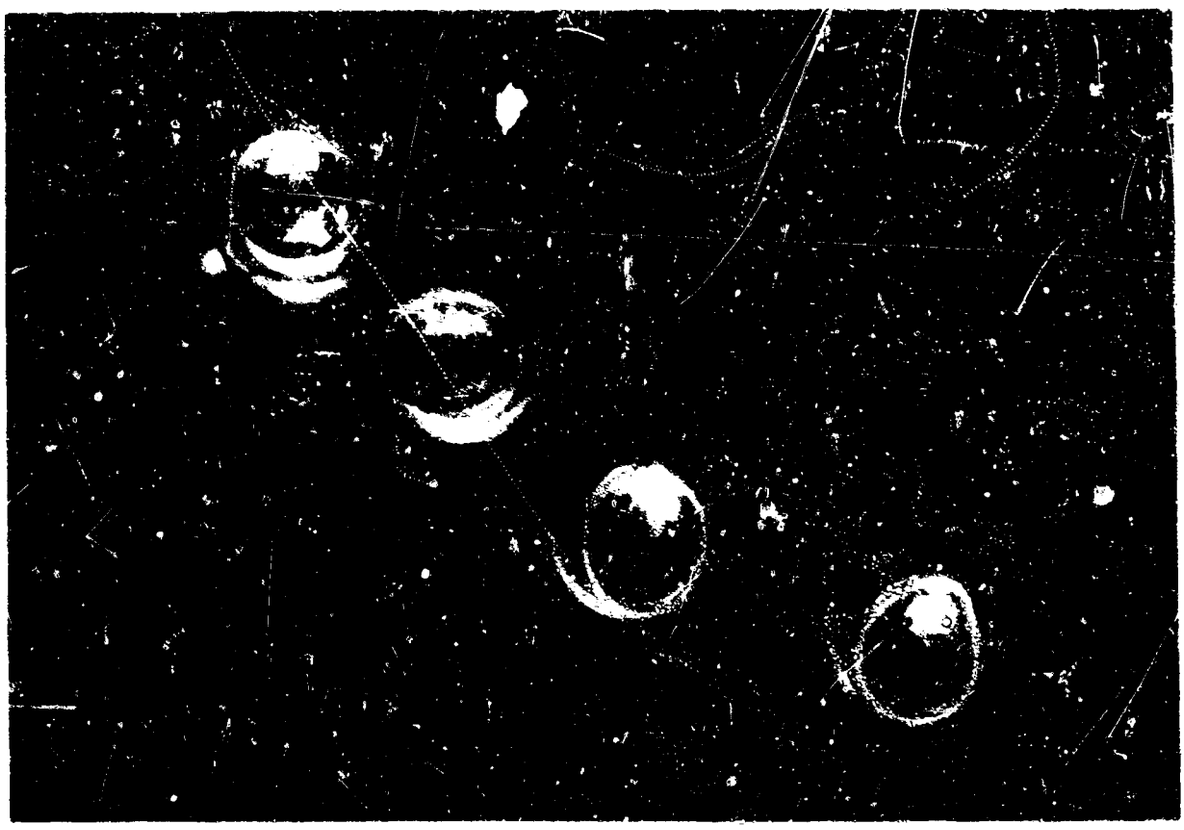
$I_{cbo}$ 10 nA
$BV_{cbo}$ 25 V

PNP epitaxial
Planar silicon

SOAK PERIOD: None

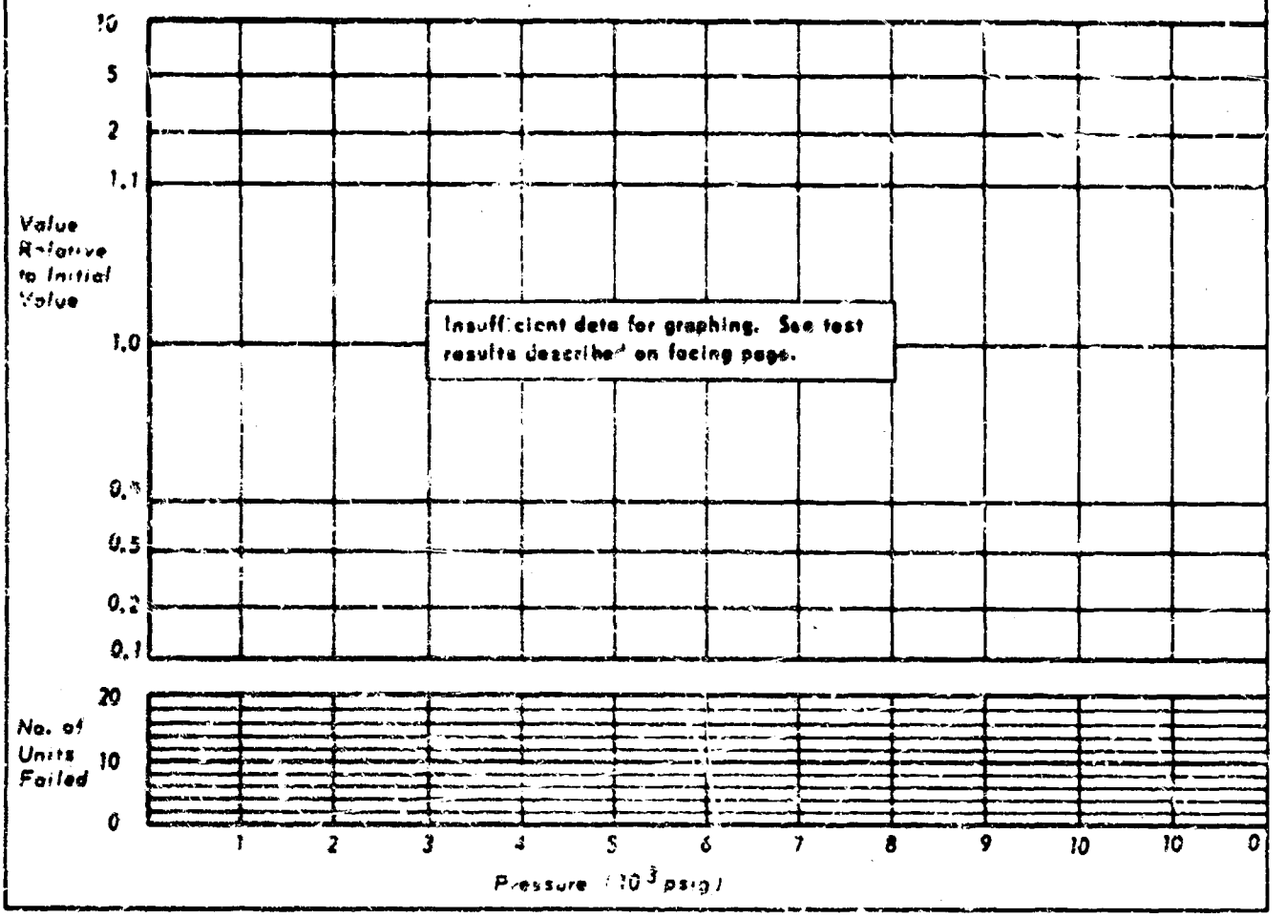
MECHANICAL: The end caps of all components were deformed.

ELECTRICAL: All components functioned normally through 6000 psig. One component continued operational through the entire test program



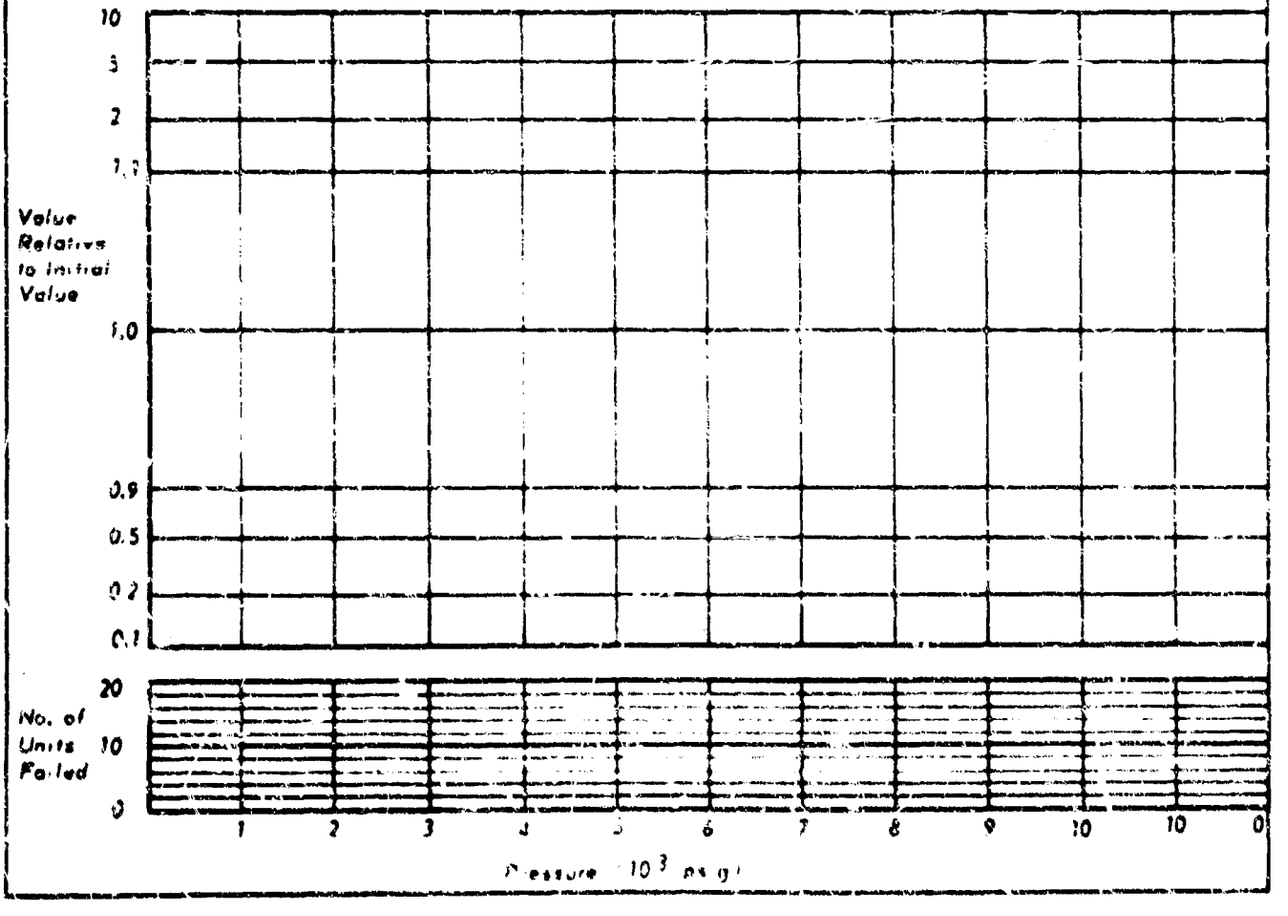
MFG. - MOTOROLA
TYPE - TRANSISTOR
DESCRIPTION - 2N2904

CHART NO. 154
NO. OF SAMPLES TESTED




MFG.
TYPE
DESCRIPTION

CHART NO.
NO. OF SAMPLES TESTED



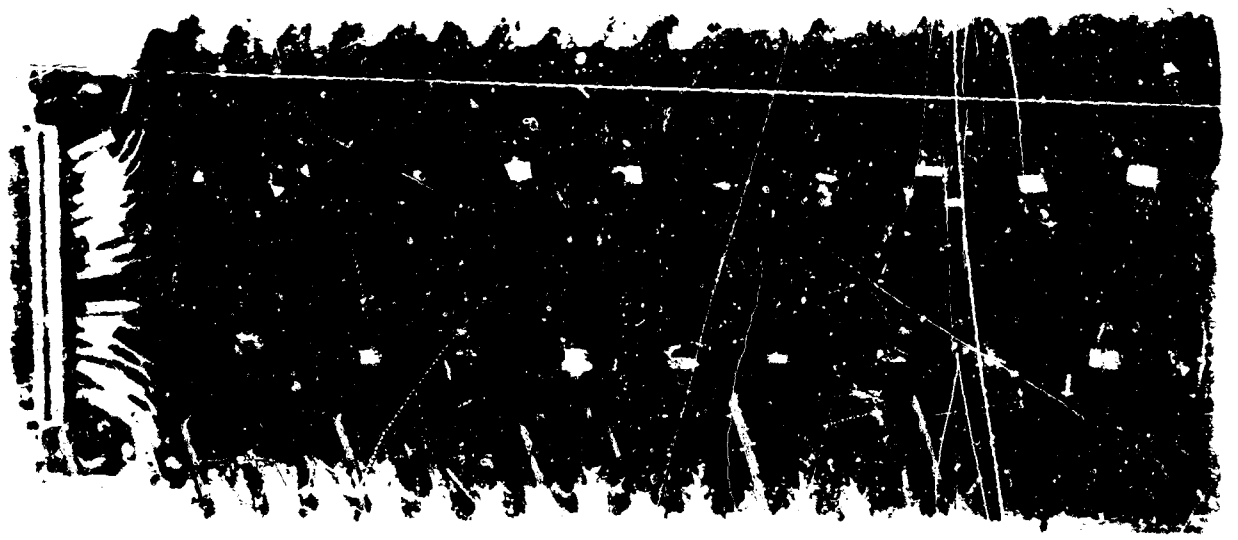
Motorola
2N 2904
Transistor
Integrated network

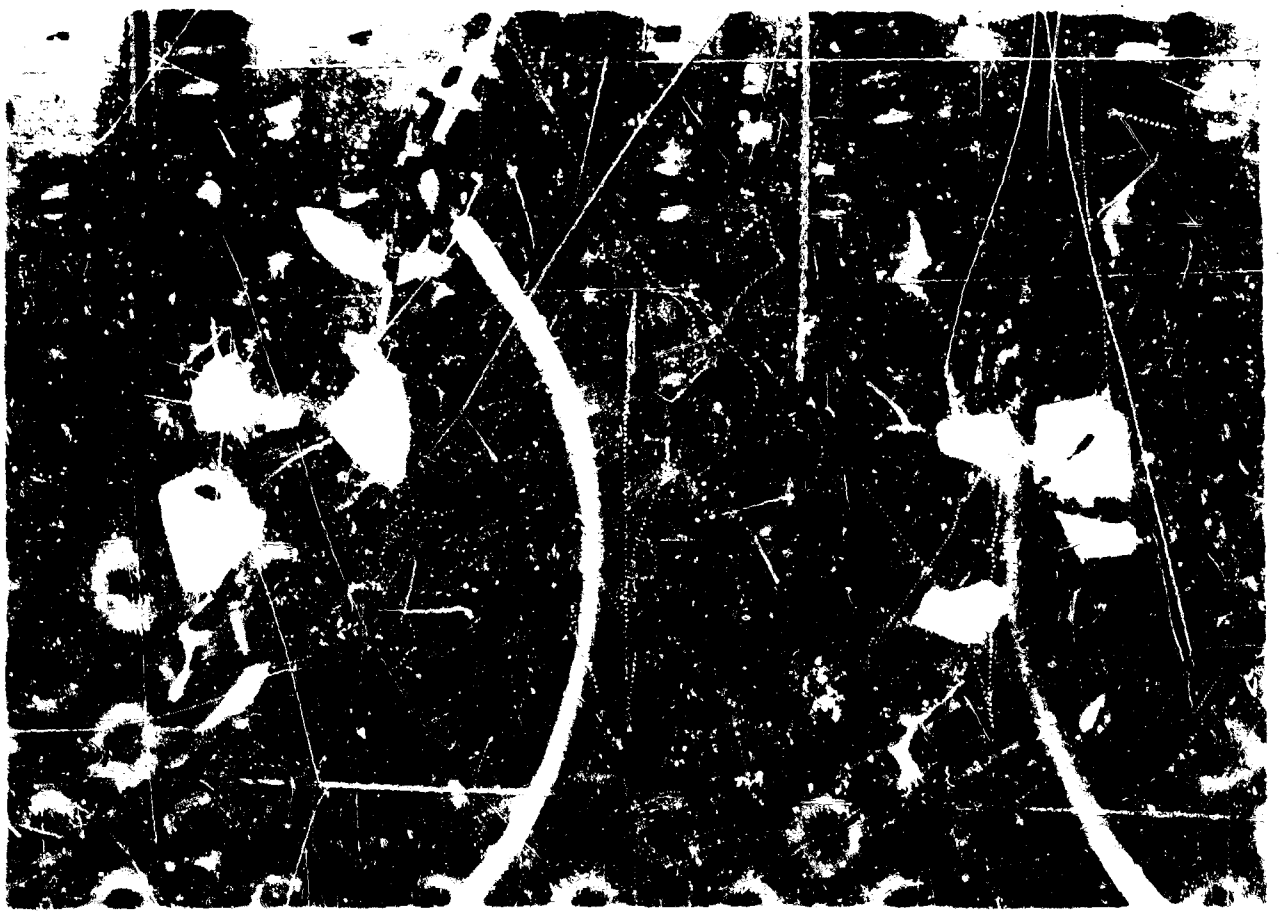
Four PNP Transistors
Silicon, passivated

Ceramic flat package
6 lead
0.25 x 0.125"

SOAK PERIOD: None

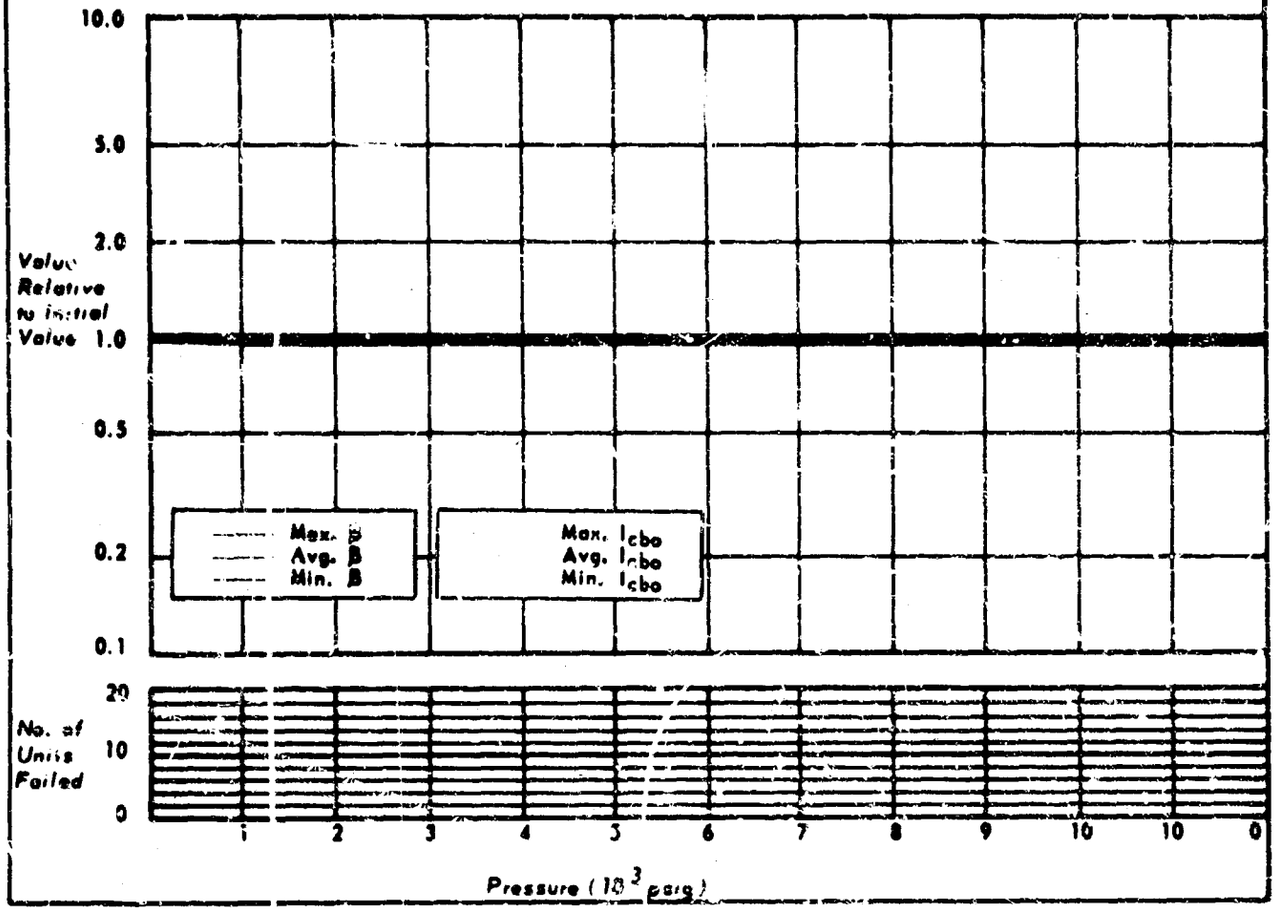
All packages were crushed before reading the 1,000 psig reading station. No electrical readings were possible other than at the initial 0 psig pressure.





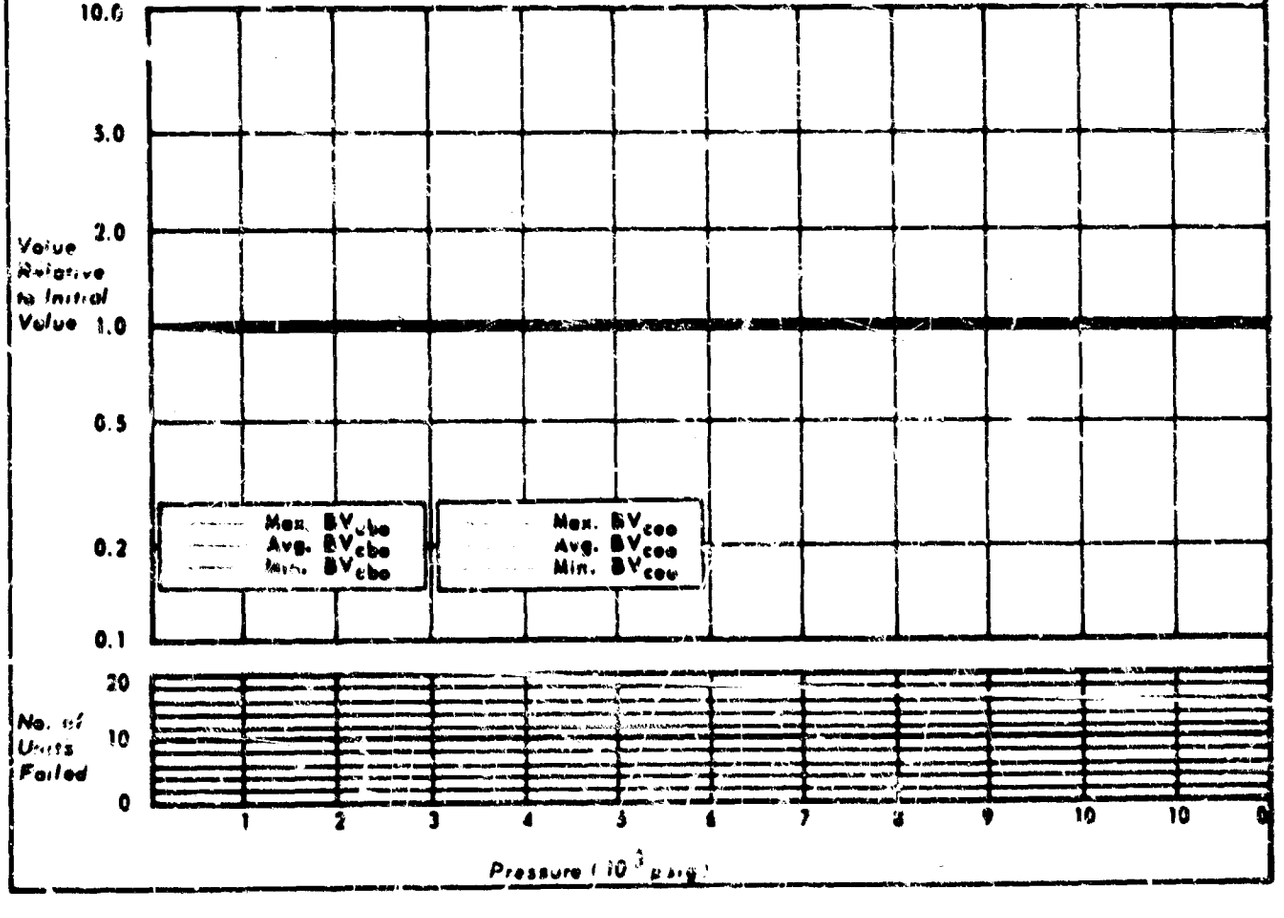
MFG. MOTOROLA
TYPE MICRO INTEGRATED NETWORK
DESCRIPTION - MD982

CHART NO. 155
NO. OF SAMPLES TESTED - 20




MFG.
TYPE
DESCRIPTION - (SAME AS ABOVE)

CHART NO. 155A
NO. OF SAMPLES TESTED



Motorola | Two PNP transistor | Ceramic flat package

MD982F | Silicon, epitaxial | 14 lead

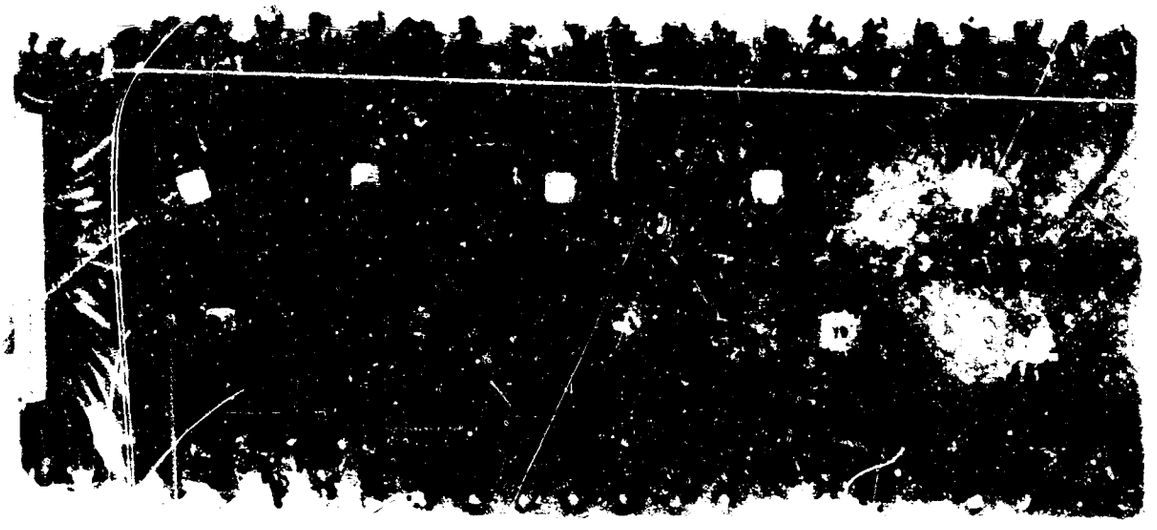
Transistor

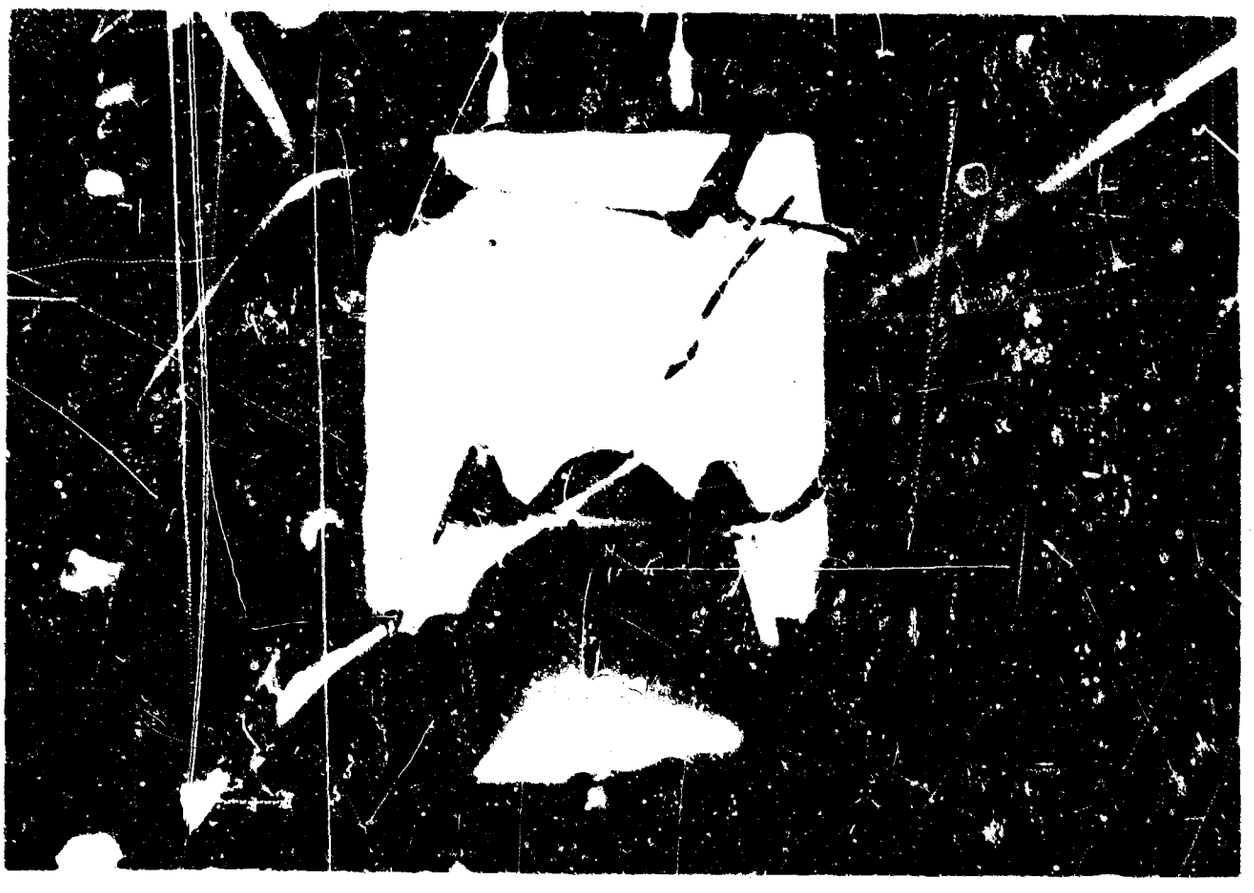
Integrated network

SOAK PERIOD: None

MECHANICAL: Sixteen packages were crushed between 1000 & 2000 psig. Four packages remained intact through the entire test program.

ELECTRICAL: Sixteen components functioned through 1000 psig. Four components functioned normally through the entire test program.





| 14. KEY WORDS | LINK A | | LINK B | | LINK C | |
|---|---|---|---|---|---|---|
| | ROLE | WT | ROLE | WT | ROLE | WT |
| Component testing | | | | | | |

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Security Classification

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*(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)*

1. ORIGINATING ACTIVITY (Corporate author)

University of California, Marine Physical Laboratory

2a. REPORT SECURITY CLASSIFICATION

UNCLASSIFIED

2b. GROUP

3. REPORT TITLE

ELECTRONIC COMPONENTS AT 10,000 PSI

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

Summary of component testing. 12 June 1964 to 1 May 1965.

5. AUTHOR(S) (Last name, first name, initial)

Anderson, Victor C.
Gibson, Daniel K.
Ramey, Roy E.

| 6. REPORT DATE | 7a. TOTAL NO. OF PAGES | 7b. NO. OF REFS |
|---|---|---|
| 1 May 1965 | 191 | 18 |

| 8a. CONTRACT OR GRANT NO. | 9a. ORIGINATOR'S REPORT NUMBER(S) |
|---|---|
| Nonr 2216 (05) | [redacted] |
| b. PROJECT NO. | |
| c. | 9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) |
| d. | MPL-U-64/64 |

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13. ABSTRACT

This report presents the results of a component test program in which a series of commercial electronic components were immersed in oil and subjected to hydrostatic pressures ranging from 0 to 10,000 psig. Over 3000 components representing 163 manufacturer types were tested. Results are presented in graphic form for the readers' own interpretation. (U)

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Security Classification

Marine Physical Laboratory
MPL-U-64/64

ELECTRONIC COMPONENTS AT 10,000 PSI by Victor C. Anderson, Daniel K. Gibson and Roy E. Ramey, University of California, San Diego, Marine Physical Laboratory of the Scripps Institution of Oceanography, San Diego, California 92152.

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V. Ocean engineering

1. Victor C. Anderson
2. Daniel K. Gibson
3. Roy E. Ramey

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